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## Growing Up Digital, Wired for Distraction

By MATT RICHTEL

REDWOOD CITY, Calif. — 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 save 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 multimillion-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 subsequent days they found that 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 Dvorak, 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 the brain have found that major cross sections of the brain become patterned in a uniquely 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 happy 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.

Like Dr. Rich, he says he believes that young, developing brains are becoming habituated to distraction and to switching tasks, not to focus.

"If you've grown up processing multiple media, that's exactly the mode you're going to fall into when put in that environment — you develop a need for that stimulation," he said.

Vishal can attest to that.

"I'm doing Facebook, YouTube, having a conversation or two with a friend, listening to music at the same time. I'm doing a million things at once, like a lot of people my age," he says. "Sometimes I'll say: I need to stop this and do my homework, but I can't."

"If it weren't for the Internet, I'd focus more on school and be doing better academically," he says. But thanks to the Internet, he says, he has discovered and pursued his passion: filmmaking. Without the Internet, "I also wouldn't know what I want to do with my life."

### Clicking Toward a Future

The woman sits in a cemetery at dusk, sobbing. Behind her, silhouetted and translucent, a man kneels, then fades away, a ghost.

This captivating image appears on Vishal's computer screen. On this Thursday afternoon in late September, he is engrossed in scenes he shot the previous weekend for a music video he is making with his cousin.

The video is based on a song performed by the band Guns N' Roses about a woman whose boyfriend dies. He wants it to be part of the package of work he submits to colleges that emphasize film study, along with a documentary he is making about home-schooled students.

Now comes the editing. Vishal taught himself to use sophisticated editing software in part by watching tutorials on YouTube. He does not leave his chair for more than two hours, sipping Pepsi, his face often inches from the screen, as he perfects the clip from the cemetery. The image of the crying woman was shot separately from the image of the kneeling man, and he is trying to fuse them.

"I'm spending two hours to get a few seconds just right," he says.

He occasionally sends a text message or checks Facebook, but he is focused in a way he rarely is when doing homework. He says the chief difference is that filmmaking feels applicable to his chosen future, and he hopes colleges, like the University of Southern California or the California Institute of the Arts in Los Angeles, will be so impressed by his portfolio that they will overlook his school performance.

"This is going to compensate for the grades," he says. On this day, his homework includes a worksheet for Latin, some reading for English class and an economics essay, but they can wait.

For Vishal, there's another clear difference between filmmaking and homework: interactivity. As he edits, the windows on the screen come alive; every few seconds, he clicks the mouse to make tiny changes to the lighting and flow of the images, and the software gives him constant feedback.

"I click and something happens," he says, explaining that, by comparison, reading a book or doing homework is less exciting. "I guess it goes back to the immediate gratification thing."

The \$2,000 computer Vishal is using is state of the art and only a week old. It represents a concession by his parents. They allowed him to buy it, despite their continuing concerns about his technology habits, because they wanted to support his filmmaking dream. "If we put roadblocks in his way, he's just going to get depressed," his mother says. Besides, she adds, "he's been making an effort to do his homework."

At this point in the semester, it seems she is right. The first schoolwide progress reports come out in late September, and Vishal has mostly A's and B's. He says he has been able to make headway by applying himself, but also by cutting back his workload. Unlike last year, he is not taking advanced placement classes, and he has chosen to retake Algebra II not in the classroom but in an online class that lets him work at his own pace.

His shift to easier classes might not please college admissions officers, according to Woodside's college adviser, Zorina Matavulj. She says they want seniors to intensify their efforts. As it is, she says, even if Vishal improves his performance significantly, someone with his grades faces long odds in applying to the kinds of colleges he aspires to.

Still, Vishal's passion for film reinforces for Mr. Reilly, the principal, that the way to reach these students is on their own terms.

### Hands-On Technology

Big Macintosh monitors sit on every desk, and a man with hip glasses and an easygoing style stands at the front of the class. He is Geoff Diesel, 40, a favorite teacher here at Woodside who has taught English and film. Now he teaches one of Mr. Reilly's new classes, audio production. He has a rap audience of more than 20 students as he shows a video of the band Nirvana mixing their music, then holds up a music keyboard.

"Who knows how to use Pro Tools? We've got it. It's the program used by the best music studios in the world," he says.

In the back of the room, Mr. Reilly watches, thrilled. He introduced the audio course last year and enough students signed up to fill four classes. (He could barely pull together one class when he introduced Mandarin, even though he had secured iPads to help teach the language.)

"Some of these students are our most at-risk kids," he says. He means that they are more likely to tune out school, skip class or not do their homework, and that they may not get healthful meals at home. They may also do their most enthusiastic writing not for class but in text messages and on Facebook. "They're here, they're in class, they're listening."

Despite Woodside High's affluent setting, about 40 percent of its 1,800 students come from low-income families and receive a reduced-cost or free lunch. The school is 56 percent Latino, 38 percent white and 5 percent African-American, and it sends 93 percent of its students to four-year or community colleges.

Mr. Reilly says that the audio class provides solid vocational training and can get students interested in other subjects.

"Today mixing music, tomorrow sound waves and physics," he says. And he thinks the key is that they love not just the music but getting their hands on the technology. "We're meeting them on their turf."

It does not mean he sees technology as a panacea. "I'll always take one great teacher in a cave over a dozen Smart Boards," he says, referring to the high-tech teaching displays used in many schools.

Teachers at Woodside commonly blame technology for students' struggles to concentrate, but they are divided over whether embracing computers is the right solution. "It's a catastrophe," said Alan Eaton, a charismatic Latin teacher. He says that technology has led to a "balkanization of their focus and duration of stamina," and that schools make the problem worse when they adopt the technology.

"When rock 'n' roll came about, we didn't start using it in classrooms like we're doing with technology," he says. He personally feels the sting, since his advanced classes have one-third as many students as they had a decade ago.

Vishal remains a Latin student, one whom Mr. Eaton describes as particularly bright. But the teacher wonders if technology might be the reason Vishal seems to lose interest in academics the minute he leaves class.

Mr. Diesel, by contrast, does not think technology is behind the problems of Vishal and his schoolmates — in fact, he thinks it is the key to connecting with them, and an essential tool. "It's in their DNA to look at screens," he asserts. And he offers another analogy to explain his approach: "Frankenstein is in the room and I don't want him to tear me apart. If I'm not using technology, I lose them completely."

Mr. Diesel had Vishal as a student in cinema class and describes him as a "breath of fresh air" with a gift for filmmaking. Mr. Diesel says he wonders if Vishal is a bit like Woody Allen, talented but not interested in being part of the system.

But Mr. Diesel adds: "If Vishal's going to be an independent filmmaker, he's got to read Vonnegut. If you're going to write scripts, you've got to read."

### Back to Reading Aloud

Vishal sits near the back of English IV. Marcia Blondel, a veteran teacher, asks the students to open the book they are studying, "The Things They Carried," which is about the Vietnam War.

"Who wants to read starting in the middle of Page 137?" she asks. One student begins to read aloud, and the rest follow along.

To Ms. Blondel, the exercise in group reading represents a regression in American education and an indictment of technology. The reason she has to do it, she says, is that students now lack the attention span to read the assignments on their own.

"How can you have a discussion in class?" she complains, arguing that she has seen a considerable change in recent years. In some classes she can count on little more than one-third of the students to read a 30-page homework assignment.

She adds: "You can't become a good writer by watching YouTube, texting and e-mailing a bunch of abbreviations."

As the group-reading effort winds down, she says gently: "I hope this will motivate you to read on your own."

It is a reminder of the choices that have followed the students through the semester: computer or homework? Immediate gratification or investing in the future?

Mr. Reilly hopes that the two can meet — that computers can be combined with education to better engage students and can give them technical skills without compromising deep analytical thought.

But in Vishal's case, computers and schoolwork seem more and more to be mutually exclusive. Ms. Blondel says that Vishal, after a decent start to the school year, has fallen into bad habits. In October, he turned in weeks late, for example, a short essay based on the first few chapters of "The Things They Carried." His grade at that point, she says, tracks around a D.

For his part, Vishal says he is investing himself more in his filmmaking, accelerating work with his cousin on their music video project. But he is also using Facebook late at night and surfing for videos on YouTube. The evidence of the shift comes in a string of Facebook updates.

*Saturday, 11:55 p.m.:* "Editing, editing, editing"

*Sunday, 3:55 p.m.:* "8+ hours of shooting, 8+ hours of editing. All for just a three-minute scene. Mind = P.m."

*Sunday, 11:00 p.m.:* "Fun day, finally got to spend a day relaxing... now about that homework..."

*Malia Wollan contributed reporting.*