Teaching the iBrain generation
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Dr. Christine K. Sorensen Irvine
Professor, Learning Design and Technology
College of Education
University of Hawaii-Manoa

Thesis of this Talk

- Today's youth have grown up with rapidly changing technologies
- Use of technology changes the brain, causing students to think and behave differently
- Therefore, the educational environments we create for them must change

Acceleration: ExponentiAL CHANGE

Moodle

Moocs

Games

Cloud

Virtual worlds

MP3 & IPods

geotagging

Flikr

Blogs

Second Life

Google

Who are today's learners?

Those in our schools today…….

Those who will be coming in the

25V

Basic concept in Instructional Design

Know Your Learners!

Poll

A. I remember a time when there was no World Wide Web

B. In my lifetime there has always been a World Wide Web.

Poll

A. I remember playing 45s and LPs and 8 tracks

B. Those were way before my time!

Poll

A. I can remember using a rotary phone.

B.I don't remember rotary phones, but I remember when cell phones first came out.

C.I have never known a time when there were no cell phones.

Poll

A. I remember a time when there were no video games.

B. I have been playing video games since I was a child.

Generation Z (Born 1990-2010)

- **Born into a digital world**
- **Have always had: www, laptops, cell phones, IM services, broadband, wireless, video games**
- **Prefer easy-to-use, interactive media**
- **Lack in a sense of privacy (lives always on display)**

Generation Alpha (Google Kids) (Born 2010-2023)

First truly 21st century generation & even more technology oriented!

Digital Natives

- Text not talk
- Prefer online
- Have friends they have never met
- Can't imagine life without cell phones
- Prefer e-books to books
- Want instant results
- "Acquired attention deficit disorder"
- Technology is a toy
- Read, text, talk, and eat at the same time
- Use abbreviated language
- Self directed, multi-taskers
- Can process information at lightning speed

Seeing the World Differently

- **Educators are complaining that kids can't concentrate or memorize content**
- **Students are thinking "why do I need to spend hours in a classroom learning this when I can Google it on an iPhone in under 5 seconds?"**

Brains are wired differently

The human brain is malleable, always changing in response to the environment. "A young person's brain, which is still developing, is particularly sensitive. ... It's also the kind of brain that is most exposed to the new technology.

Dr. Gary Small, UCLA Today

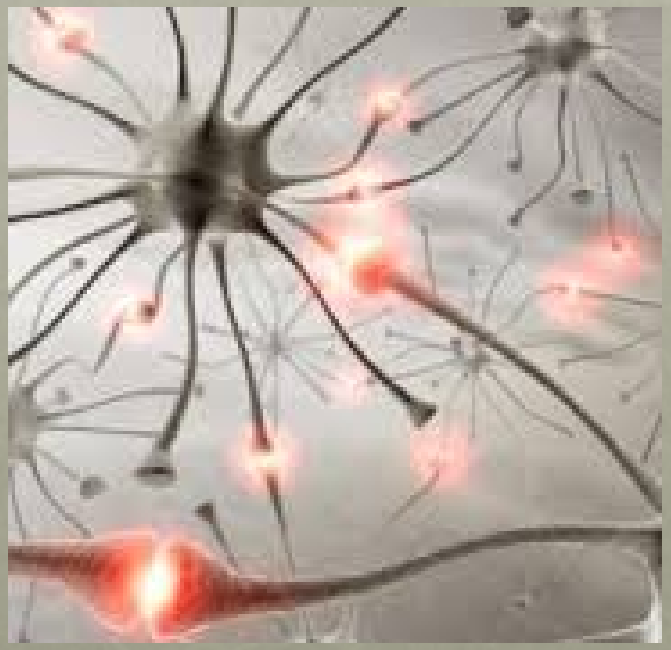
http://www.today.u

Brain Plasticity

Neuroplasticity is the potential for, or ability of, neurons or brain systems to modify functionality based on experiences. But not all brains have equal amounts of plasticity. Generally, the younger the brain, the more plastic it i

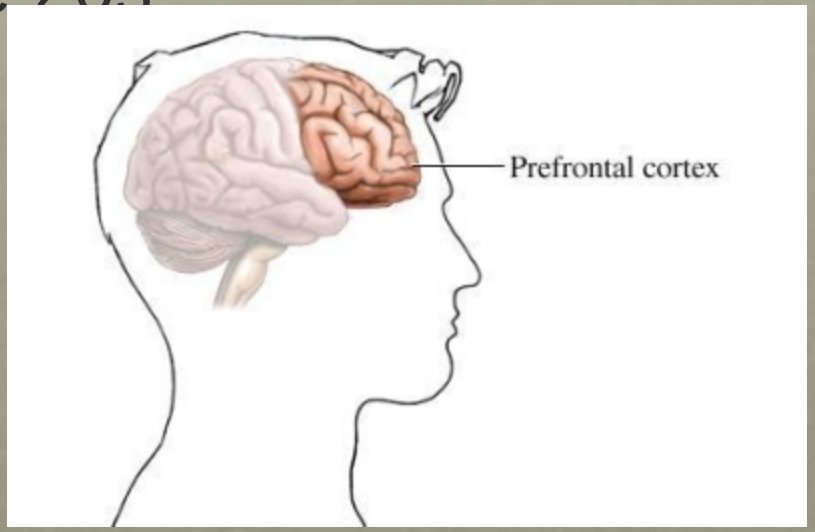
BRAIN MALLEABILITY

Brains are malleable. If we spend a lot of time engaged in a repeated mental task, the neural circuits will strengthen. Conversely, if we neglect those tasks, the neural circuits will weaken. The brain “prunes” away these pathways, concentrating on strengthening the ones we use more often.



Prefrontal Cortex

- Technology affects prefrontal cortex, the executive controller for working memory, attention and focus, decision making, multitasking control, and impulse control
- The last area to be myelinated is the prefrontal cortex completed in late 20s



Students Today…..

- **They are no longer the people our educational system was designed to teach**
- The pervasive nature of our digital culture has and continues to change the brains of our students. As a result, they have developed learning styles and preferences in contrast to the traditional pedagogical approaches and learning environments we find in education today.

Digital Learners

Some research findings……

Sample Findings

- **Don't necessarily read from left to right, or from beginning to end.**
- **More sensitive to visual icons than older people**
- **Faster at switching tasks**
- **Better at blocking out background noise.**

- A Closer Look

How They Read

- **Older generation reads in a classic Z-pattern that moves from left to right sequentially**
- **Digital generation reads in an F-pattern, ignoring the right side and bottom half of the page and going to those areas of the page only if they are motivated to do**
- **Mimics video games and web - scanning screen for information**

21st century fluency project

Access Information

- **Older generations prefer sequential and straightforward information**
- **Digital learners prefer random, nonlinear access to hyper-linked multimedia.**
- **May make it more difficult for students to follow a linear train of thought and to do some types of deep or logical thinking because they become easily bored.**

21st century fluency project

Reward Frequency

- Video games coerce the player into making constant split-second decisions, and rewards choices at regular intervals - usually every 7 to 10 seconds of gameplay.
- Gamers' brains showed increased striatum activity (risk and reward)
- In the typical classroom, a student is only given the opportunity to ask a question or make a personal decision once every 25 minutes.

21st century fluency project

Reaction time

- Players of fast-paced video games can track the movement of a third more objects on a screen than non-players. Better peripheral vision.
- Improved reaction time and ability to pick out details amid clutter.

Daphne Bavelier, University of Rochester

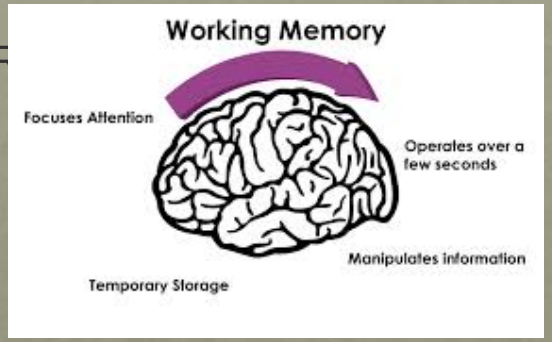
Memory

- **Video games and other screen media improve visual-spatial capabilities, increase attentional ability, reaction times, and the capacity to identify details among clutter.**
- **Less adept at remembering things and more skilled at remembering where to find things.**

Short-term memory

- Digital natives have higher baseline activity in the part of the brain governing short-term memory, the sorting of complex information, and the integration of sensations and thoughts
- IQ scores are on the increase in the United States as the number of digital natives rises

John K. Mullen (March 16, 2012) Harvard Business R
Slow to Pick Up Nonverbal Cues



Learning Style

Digitals prefer dealing with questions rather than answers, sharing their opinions, participating in group projects, working with real-world issues and people, and having teachers who talk to them as equals rather than as inferiors.

The 21st-Century Digital Learner

Visualizing

- They are better able to deal with two- and three-dimensional images and spatial visualization.
- They have the skills needed to read images, the ability to recognize the information which images contain, as well as the ability to interpret images.
- Visual cortex 20% larger than brains measured 20 years ago.

OECD

Attention

- Used to the twitch-speed, multitasking, random-access, graphics-first, connected, fun, quick-payoff world of video games and the Internet, and are incredibly bored by most of today's education ***(Steven Johnson)***
- Information overload causes distraction *(Melina Uncapher - Stanford U)*

Multi-tasking

Study compared heavy multi-taskers (based on answers to how they used technology) with non-multi-taskers. Results showed multi-taskers…..

- had more trouble filtering irrelevant information
- took longer to switch among tasks
- were less efficient at juggling problems.
- tended to search for new information rather than accept a reward for putting older, more valuable information to work
- were more sensitive to incoming information.

Eyal Ophir – Stanford University

Spatial ability

- Exposure to the proliferation of imagery in media has contributed to selective increases in nonverbal intelligence scores during the past century in industrialized countries, especially on items that draw on spatial visualization due to the increased use of audiovisual media by children.
- Children's exposure to computer screens and, particularly, to videogames may have a similar long-term effect, individually and perhaps generationally,
    - *Flynn Effect - OECD*

Interpersonal

- Excessive, long-term exposure to electronic environments is reconfiguring neural networks and diminishing ability to develop empathy, interpersonal relations, and nonverbal communication skills.
- One study indicated that face-to-face interaction time drops by nearly 30 minutes for every hour a person spends on a computer.
- Another study showed after long periods of time on the internet, students displayed poor eye contact and a reluctance to interact socially
- Slower to pick up on nonverbal cues such as facial expressions, tones of voice, and body language.

John K. Mullen (March 16, 2012) Harvard Business Review, **Digital Natives Are Slow to Pick Up Nonverbal Cues**

anxiety

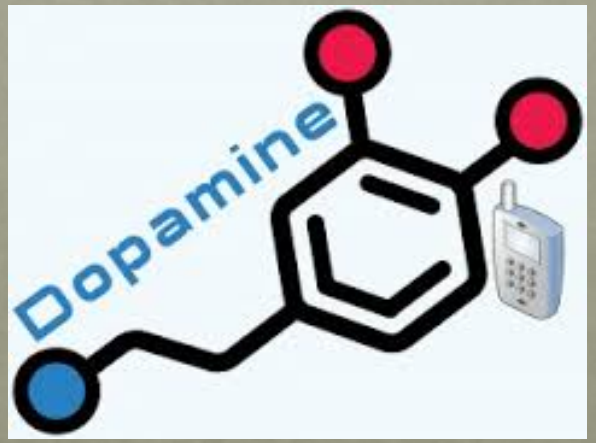
- Study on anxiety and technology showed light users less anxious and heavy users much more anxious
- One strategy tested was to give technology breaks in schools – every fifteen minutes students were given a tech break, then over time expanded to longer times between breaks – less anxiety

Larry Rosen, Technology and the Brain

engagement

- Research has shown that the sound of a text message or an email hitting your inbox leads to the release of dopamine, a chemical activated when something enjoyable happens unexpectedly.
- Over-using technology trains the brain to relate these feelings of pleasure with this kind of interaction, further amplifying the desire to engage with it.

October 15, 2013 **The Effect Of Technology On The Brain**



Thinking

- Internet trains minds to have a “staccato” train of thought, jumping from idea to idea, like from Website to Website.
- **Trained not to think deeply when texting quick snippets, Tweeting short thoughts, or clicking on a simple thumbs up or thumbs down**
- **Experience information overload and have no time for reflection or problem solving.**
- **Technology trains the brain to be nimble and to process new ideas quickly. We become more open to new ideas, and communicate more freely and frequently**
- “The brain is complex,” … The answers are not straightforward.

Dr. Gary Small, UCLA Neuroscientist

"Your Brain on Google" *(Small study)*

- "Internet-naïve" (age 55-76 who had very little experience online) vs. "Internet smart"
- Reading a book versus conducting a Google search.
- "Internet savvy" group - twice as much brain activity in all parts of the brain while conducting a Google search vs. reading.
- "Internet-naïve" group - significant burst in frontal lobe activity, which controls short-term memory and decision-making.
- Small's conclusion? "Searching online is brain exercise."
- Surgeons who play video games make fewer surgical errors and have improved reaction time, better peripheral vision.

Video Game Study

Studied young people playing high-action videogame called Unreal Tournament

Improved vision, specifically attending to multiple details on-screen

After just 30 hours, players a substantial increase in the spatial resolution of their vision, meaning they could see figures like those on an eye chart more clearly, even when other symbols crowded in

Could focus on what's happening at multiple areas of the

Performed better than non-gamers on certain tests of attention, speed, accuracy, vision and multitasking

Our Digital learners

How should we change education????

How do we design learning environments for digital learners?

It’s a Changing world!

Education must change too!

Challenging Our Assumptions

Assumptions about

What is education

Who is the teacher and who is the student

When does education occur

How does education occur

Where does education occur

Where is the repository of knowledge

Small group discussion

Discuss your own assumptions and how some of the information about today's learners might challenge them. What are your ideas for the future?

Who is the teacher and what is their role

When does education occur

Where does education occur

How does education occur

Where is the repository of knowledge

Dumping the industrial model

- Instead of focus on teachers, focus on students
- Instead of lecturing, interact with students, listen to them
- Instead of memorizing information, teach critical thinking
- Instead of broadcast style, help students discover for themselves
- Instead of one-size-fits all, customize to fit individual needs
- Instead of isolation, use collaboration
- Not just-in-case, but just-in-time and active learning strategies
- Shift from constructivist paradigm to connectivist paradigm

Don Tapscott 2009 – Grown Up Digital: How the Net Generation is Changing your world

Is it time to move?

FROM	TO
Mass production	Mass customization
Teacher/school information model	Ubiquitous information model
Black and white text focus	Sensory rich and multimedia focus
3 Rs	Digital literacy

Time to Consider

Consider	Shifts
Learning Spaces	Flexible, social de-centered, virtual, community embedded, technology rich
Learning Tools & Technologies	Digital, blended, media rich, seamless, open, integrated, augmented
Learning Approaches	Formal/informal, project/problem based, competency based, internships, personalized, just-in time, modular
Role of Teachers	Learning coach, monitors progress, mastery learning, blended environments
Role of Institutions	Responsive, efficient, accountable

Imagine Learning Environments that include

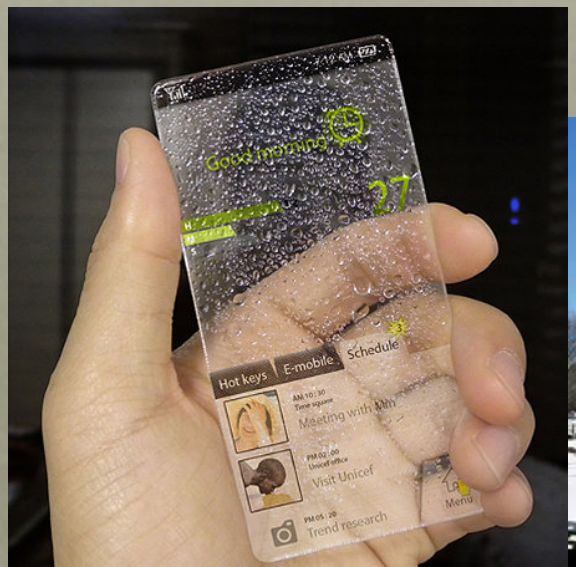
- Online resources (beyond text)
- Open resources (free)
- Integrated image, text, location
- Digital storytelling
- Visualization, simulation
- Remote instruments
- Haptics (touch)
- Augmented reality
- Virtual experiences
- Science gateways
- Individualized experiences
- Modular approaches

Access to education that is

- **Just-in time**
- **Modularized**
- **Competency-based**
- **Anytime, anyplace**
- **Seamless**
- **Tailored**

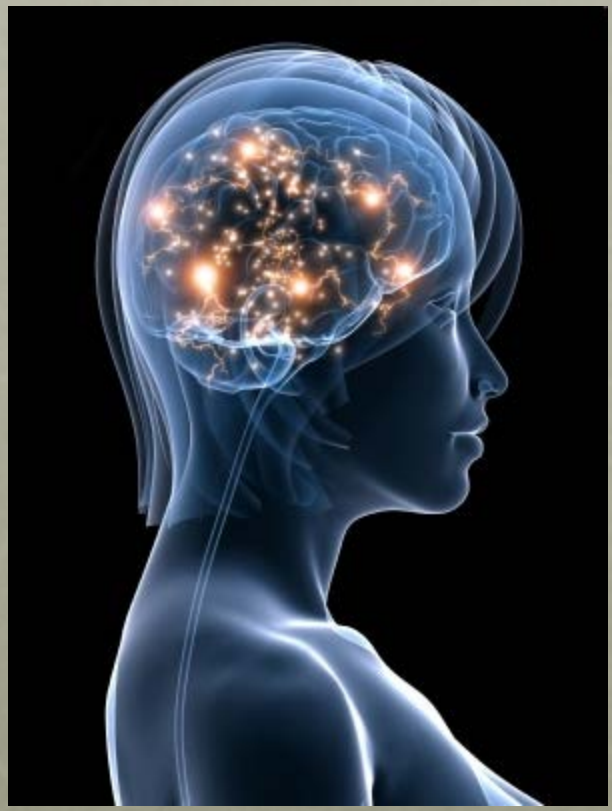
Challenge

- Don't try to fit into the existing model!
- What are the new models possible that can help meet the needs of digital learners??



It Is Not About the Technology

- It is about a rapidly changing world
- It is about the changing minds of our learners
- It is about the changing needs of our learners

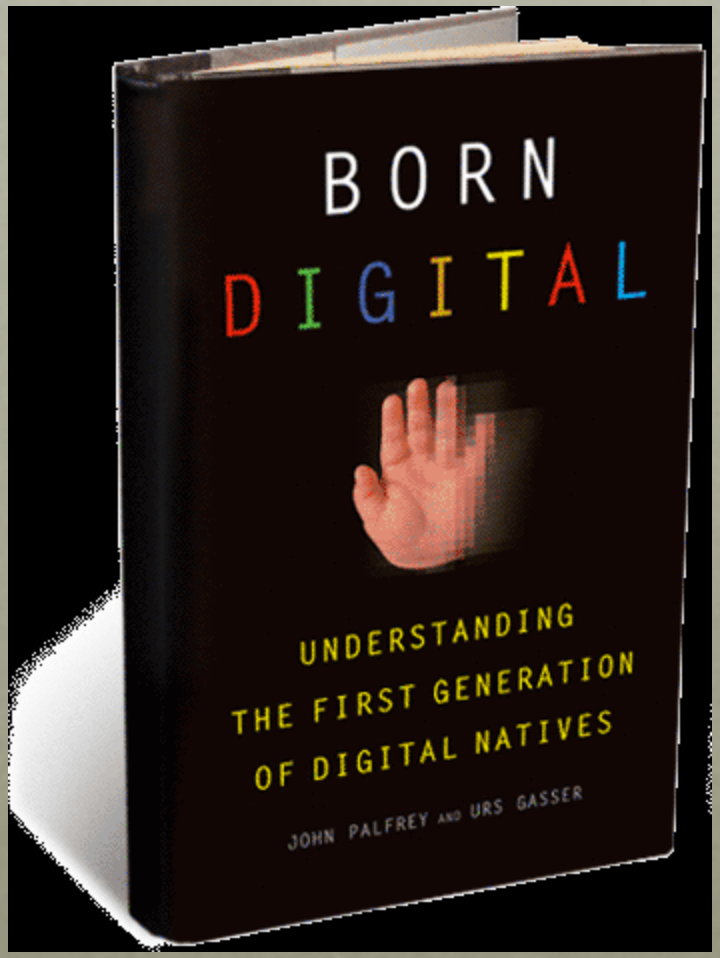


We must change and adapt

We must re-think

The principle goal of education is to create men and women who are capable of doing new things, not simply of repeating what other generations have done. (Piaget)

If we teach today's students as we taught yesterday's, we rob them of tomorrow. (John Dewey)



Are we ready for digital learners?

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Mahalo