How Do You Leverage the Latest Technologies, including Web 2.0 Tools, in Your Classroom?

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How do you determine what technologies to use in your classroom? Do you have a set of criteria to systematically select the tools? Are they linked to your students' characteristics, pedagogy, and learning outcomes? This article synthesizes the findings from previous research on the 10 major learner characteristics of this Net Generation of students which have specific implications for how technology should be used in your classroom. Armed with this intelligence information (aka "intel) on your students, you can then leverage technology tools they are already using to match their characteristics. This approach allows you to custom-tailor your teaching strategies to fit your students first. A variety of technology strategies are suggested that match their characteristics. They furnish a vehicle to connect with them and build trust and credibility. Once that is established, you can expand your choices of technology beyond their world.

Keywords: Net Generation, Millennials, multimedia teaching, technology in the classroom, collective intelligence, social media, search engines, multiuser games, multiplayer virtual environments, digital storytelling

Just because this generation of students grew up with the technology and all of the tools of the digital age doesn't mean that throwing technology at them in the classroom will automatically result in effective teaching and their learning. You need to understand *how they use technology* and *how they think* before systematically applying technology in your classroom. In other words, collect intelligence information (aka "intel") on your students so you can match technology tools to their characteristics.

This is analogous to ex-Marine Jake Sully's task in *Avatar*: to gather intel on alien, supermodel-like, 10-feet tall, blue-skinned, golden-eyed Na'vi inhabitants of the computer-generated sci-fi world of Pandora. His purposes were to gain their trust in order to set up schools, teach them English, and convince them to leave their homeland

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voluntarily. Why? Because, if they didn't leave, psycho-warrior Colonel Miles Quaritch will blow them to kingdom come, digitally-speaking, of course.

Consider this scenario: YOU are in your teacher-Gen X (born 1961–1981) or Boomer (born 1943–1960) world and your STUDENTS (born 1982–2003) are in their high-tech, twitch-speed, digital, mobile, always-on media world. Their world may be perceived as a bit alien by some of you. Could this possibly be a "Close Encounter of the Student Kind"? Now that these alien analogies are over, it's time to move on.

WHERE DO YOU BEGIN TO BRIDGE THESE TWO WORLDS?

Let's begin with your students. To date, more than 40 books have been written on this generation of students which report the results of several national and international surveys and other research that describe their characteristics. Nine examine the educational implications of those characteristics (Bonner, Marbley, & Hamilton, in press; Howe & Strauss, 2000; Junco & Mastrodicasa, 2007; Oblinger & Oblinger, 2005; Palfrey & Gasser, 2008; Pletka, 2007; Strauss & Howe, 2003, 2006; Sturgess, 2008).

Given that these volumes as well as the supportive articles and chapters are written from a variety of perspectives, there is no consensus on one set of characteristics or teaching strategies matched to those characteristics. So how do you define this generation? You need to understand your students and their culture so you can custom tailor the technology strategies to their characteristics.

The purpose of this article is to extend the work published in previous articles synthesizing the characteristics of this generation (Berk, 2009b) into a profile (Berk, 2010). It will furnish a clarification of the technology-related characteristics for teachers and administrators and suggest specific technology directions for future teaching in this digital culture. The article is partitioned into seven sections: (1) birth date and terminology definitions, (2) survey research evidence, (3) a generation "born with a chip," (4) access and use of technology, (5) learner characteristics, (6) technology strategies to match Net Gener characteristics, and (7) conclusions.

BIRTH DATE AND TERMINOLOGY DEFINITIONS

Although the birth dates used to define this generation have varied in different surveys, there seems to be some agreement in the literature—typically between 1982 and 2003 (standard error of $\pm$ 2years). Those students are now 6 to 27 years old. That translates educationally into first grade through graduate school. No educator can escape the impact of this generation. That means: "No Teacher Left Behind."

The name for this generation has been considerably more contentious. Authors and researchers have used a variety of terms in their articles and books, such as Millennials, Generation Y, Trophy Kids, Net Generation, and Digital Natives, to cite just a few. This has produced considerable confusion and much debate over the most appropriate label. There are at least 10 proposed names or monikers. For a discussion of those names and their rationales, see Berk (2009b).

This article uses *Net Generation* (or *Net Geners*), which was coined by Tapscott (1997). It is linked directly to the (Inter)net and the emerging digital technology of the 1980s and 1990s with which this generation grew up. They never knew a world without computers and the Internet. This term also seems to be the simplest, most descriptive, least controversial, and easily understood, plus it denotes the profound influence of the Internet on these students' lives.

SURVEY RESEARCH EVIDENCE

Over the past decade as the Net Geners were maturing, graduating high school and college, and entering graduate school or the workforce, they were surveyed and studied by several researchers. In fact, this generation has been scrutinized, interviewed, surveyed, poked, and prodded more than any previous generation. Their impact on education at all levels has been a major interest of researchers and educators. Now the eldest members are graduating college and attending graduate school or entering the workforce in droves.

Previously, Berk (2009b) synthesized pertinent research evidence based on 10 national and international surveys over the past decade. For information on the methodologies employed, consult the specific study resources given below:

1. EDUCAUSE (Frand, 2000; Oblinger, 2008b; Oblinger & Oblinger, 2005)
2. College Students' Perceptions of Libraries and Information Resources Survey (Online Computer Library Center [OCLC], 2006)
3. Greenberg Millennials Study (Greenberg & Weber, 2008)
4. Higher Education Research Institute (UCLA) American Freshman Survey (Pryor et al., 2009)
5. National Center for Education Statistics (NCES & Kridl, 2002)
6. Net Generation Survey (Junco & Mastrodicasa, 2007)
7. The Net Generation: A Strategic Investigation (Tapscott, 2009)
8. Nielsen NetView Audience Measurement Survey (Cashmore, 2009; Ostrow, 2007)
9. Pew Internet and American Life Project (Horrigan, 2006; Horrigan & Rainie, 2005)
10. Technological preparedness among entering freshman (Sax, Ceja, & Terenishi, 2001)

A GENERATION "BORN WITH A CHIP"

While in the classroom, this generation of students may IM or text their buddies while taking notes on their PCs or iPads, Web-surfing, scanning an iTunes playlist, and reading *The Color Purple* (Carlson, 2005). While this behavior may not be fully appreciated by their teachers, it is part of their lives, unless their electronic tools are disallowed or being serviced for their 10,000 call tune-up.

There are nearly 90 million Net Geners flooding the schools and the workplace, which is almost one-third of the U.S. population. Today's undergraduate and graduate students who are part of this generation comprise the majority of students in higher education. These teen and 20-something individuals have shared several major life events together. The burgeoning technology alone has had a profound effect on this generation, unlike any previous one, such that they were "born with a chip."

Are they significantly different from other generations? You bet! These students have grown up with *Sesame Street*, MTV, reality TV, the Internet, PCs/Macs, video games, Facebook, MySpace, Flickr, Skype, iPods, iPhones, iPads, PDAs, and TV/DVD remotes as appendages to their bodies (Berk, 2008a, 2008c). How über cool is that? They carry an arsenal of electronic devices with them. Those are key ingredients in their world. Their use of the technology focuses on social networking, music, videos, TV programs, and games. They live in a world of media overstimulation and absolutely love it.

The technologies provide a bay window into this world. Their world is not better than or inferior to ours; it's just different. Like the world of Pandora, how do you connect with their world? One approach is to understand the Net Geners' learner characteristics and

then leverage the technologies with which they're already familiar in your teaching. Grasping the extent of their access to and use of technology in their daily lives is one place to start.

ACCESS AND USE OF TECHNOLOGY

According to a survey of 7,705 college students in the U.S., Junco and Mastrodicasa (2007) found the following characteristics of Net Geners (except where noted):

- 97% own a computer
- 94% own a cell phone or iPhone
- 99% use the Internet for research or homework (Pryor et al., 2009)
- 89% begin their search of everything with search engines like Google (OCLC, 2006)
- 76% use Instant Messaging (IM) logged on 35 hrs./wk., chat 80 min./day, and 15% logged on 24/7
- 87% read news Websites (Pryor et al., 2009)
- 34% use Websites as their primary source of news (40% use TV with 15% watching *The Daily Show* and 5% *The Colbert Report*)
- 57% are media creators (Oblinger, 2008b); 35% own a blog and 57% read blogs (Pryor et al., 2009)
- 49% download music using peer-to-peer sharing (15% download movies and 16% download software)
- 92% multitask while IMing
- 75% have a Facebook account
- 56% own an MP3 player (iPod, Zune, Sansa, or similar music/video device)

LEARNER CHARACTERISTICS

Among the 20 common-denominator learner characteristics previously identified by Berk (2009b), there are 10 that have specific implications for the use of technology in the classroom. Those implications are discussed below:

1. TECHNOLOGY SAVVY

Having grown up with the technology, the Net Geners' familiarity with most forms of gadgetry listed previously is second nature. They have spent their entire lives surrounded by all of the toys and tools of the digital age (Carlson, 2005). The technology affects everything they do and buy. They expect information to be at their fingertips. Their experience with the technology has enabled them to master complex tasks and make decisions rapidly (Junco & Mastrodicasa, 2007; Prensky, 2006).

However, they are not necessarily "net savvy" (Lorenzo & Dziuban, 2006). They are exposed to tons of information, but lack an understanding of how to find, evaluate, use, and present that information. They need to be taught information literacy and strong critical thinking skills (Oblinger & Hawkins, 2006; Rockman & Associates, 2004).

A digital divide also exists among Net Geners based on machine vintage, connectivity, online skills, autonomy and freedom of access, computer support, and interest in using the technology (Hawkins & Oblinger, 2006; Oblinger, 2008a). For those students who are neither tech nor net savvy due to class, nationality, or other factors that limit access, special instruction or training sessions should be provided to give them opportunities to be brought up to the same level of their more proficient peers.

2. RELIES ON SEARCH ENGINES FOR INFORMATION

About 89% of Net Geners begin searches for everything with search engines like Google (OCLC, 2006). They have an "ease-of-use" mentality. Their high comfort level with the technology has fostered a false sense of ability such that they routinely overestimate their skills at finding and evaluating online information (Manuel, 2002).

The search process is even more meandering and interactive than previously (Bodi, 2002). An Online Computer Library Center (OCLC) (2006) survey of 394 undergraduate and graduate students from six countries indicated that 94% consider search engines to be a good or perfect fit for their lifestyle, while 63% consider online or physical libraries to be a fit. While the libraries' resources are considered more accurate and trustworthy than search engines, they fall far short of students' expectations of speed, convenience, ease of use, cost-effectiveness, and reliability (OCLC, 2006).

3. INTERESTED IN MULTIMEDIA

They are accustomed to entertainment, speed, and accessing music, videos, games, and information their own way. They prefer interactive media rather than passive TV. For example, online games provide that interactivity; they have experience with massively multiuser games, such as World of Warcraft, and participate in virtual worlds, such as Second Life (Gibson, Aldrich, & Prensky, 2007). These virtual worlds are immersive, animated, and 3D environments (Oblinger, 2008a).

They also move seamlessly between real and virtual worlds. The Net Geners are *nomadic*—they get whatever they want whenever and wherever they want it (Abram & Luther, 2004; Tarlow & Tarlow, 2002). It's theirs for the taking. Many will obtain their music, videos, ringtones, and software free, illegally, online rather than buy it. Leveraging these media in the classroom is critical to connecting with their culture (Berk, 2003, 2008b, 2009a; Eddy & Bracken, 2008; Miller, 2009).

4. CREATES INTERNET CONTENT

They are not only avid users of the technology, with 90% using the Internet to assist with homework; they also contribute to its content. About 57% design and write Websites, post blogs with pictures and original artwork, and make videos for YouTube daily.

The Web 2.0 evolution has produced social bookmarking, which permits students to tag, comment, evaluate, and collect published works (Polin, 2007). It fosters direct peer-to-peer engagement to create, share, and interact via networks such as Flickr, del.icio.us, and Digg.com. The students are major contributors to the Internet by developing, consuming, commenting on, and rating Web materials.

5. LEARNS BY INDUCTIVE DISCOVERY

They prefer to learn by doing rather than being told what to do or reading text or manuals. They are kinesthetic, experiential, hands-on learners. They must be engaged, constantly connected with first-person learning, games, simulations, and role playing (Junco & Mastrodicasa, 2007; Oblinger & Oblinger, 2005; Tapscott, 1999).

Multiplayer virtual environments allow students to play roles of experts (as avatars), such as physicians, astronauts, and physicists, that otherwise would not be possible in the real world (Oblinger, 2006, 2008a; Rauch, Cohodas, & Wang, 2009). The 3D version of *Avatar* punctuated the impact that this type of environment can have on anyone. Jenkins

(2006b) refers to this generation as a *participatory culture*; these students are not spectators.

6. MULTITASKS ON EVERYTHING

They can naturally do several tasks easily at the same time. The Net Geners can move quickly from one activity or medium to another, such as using texting, chatting with their friends on a cell or smart phone or iPhone, and e-mailing all at once, while surfing the Net and watching TV or doing homework (Junco & Mastrodicasa, 2007; Prensky, 2006; Roberts, 2005). Mixing play and work is common.

7. COMMUNICATES VISUALLY

They are visually literate, comfortable in an image-rich rather than text-only environment. Many don't like to read books, especially textbooks, although they do it when required (Vaidhyanathan, 2008). They perceive print as expensive, boring, and a waste of time (Gomez, 2007).

Instead, they prefer visuals, graphics, and images of any kind, such as icons, videos, and photos. They communicate visually by capturing images with mobile phones or video cameras, then sharing them through MySpace, Facebook, or similar social media (Oblinger, 2008a). They post photos on Flickr and videos on YouTube or UthTv. Video network sites, such as YouTube, vids.myspace.com, and Google, AOL, MSN, and Yahoo!, are booming, particularly Veoh (Ostrow, 2007). Social bookmarking permits them to share images in a peer-to-peer world (Polin, 2007).

Online virtual and augmented reality environments provide animated and 3D experiences (Rauch et al., 2009; Yair, Mintz, & Litvak, 2001). Photovoice can promote dialogue and knowledge about important issues through online large and small group discussion of photographs (Perry, Dalton, & Edwards, 2009; Wang & Burris, 1997).

Although Net Geners are visually oriented, they are able to weave together images, text, and sound easily as well as move between the real and the virtual instantaneously (Frand, 2000; Manuel, 2002; Oblinger, 2008a). Live classroom demonstrations with music also provide powerful, unforgettable images (Berk, 2001, 2002, 2007, 2008b).

8. EMOTIONALLY OPEN

They express their feelings easily. They are open to meeting new people, sharing personal information, and digital storytelling online in blogs, wikis, Facebook, MySpace, or other social media (Junco & Mastrodicasa, 2007; Lenhart, Rainie, & Lewis, 2001; Oblinger, 2008b; Oblinger & Oblinger, 2005).

9. PREFERS TEAMWORK AND COLLABORATION

As stated above, the Net Geners have strong social tendencies and a need for interpersonal interaction, both online and face-to-face (Junco & Mastrodicasa, 2007; Ramaley & Zia, 2005; Strauss & Howe, 2006; Tapscott, 2009; Windham, 2005). They prefer to work in teams rather than alone. Collaboration enables their "collective intelligence" to emerge through the pooling of knowledge, research, arguments, and insights from diverse groups of people (Jenkins, 2006a).

Collaborative activities can include creating skits, demonstrations, and parodies with music and videos to illustrate concepts and processes (Berk, 2002, 2007, 2008a, 2008b, 2009a, 2009c; Berk & Trieber, 2009). Photovoice is another collaborative online strategy

for both large and small group discussion (Perry et al., 2009). Social bookmarking with blogs and wikis is also gaining traction as a method to facilitate online collaboration among students and between students and the professor (Mindel & Verma, 2006). Websites such as Flickr and del.icio.us have become very popular. Students can schedule meetings with their friends online using Wiggio, which allows them to send mass TMs and voice mails.

10. PREFERS TYPING TO HANDWRITING

Taking notes in class the old fashioned way is not the Net Geners' way. They want to type notes, communications, essays, and term papers on their PC/Mac, iPhone, or iPad. That is what they are used to doing. The advantages of Word far outweigh any alternative of verbal print communication (Frand, 2000).

TECHNOLOGY STRATEGIES
TO MATCH NET GENERS' CHARACTERISTICS

The preceding 10 characteristics are typical of most Net Geners, according to the surveys. Understanding these characteristics of *your* students is essential to connect with them. You can even administer the 15-item Net Gener Profile Scale to assess how closely your students fit the research-based characteristics (Berk, 2010).You also need to know their culture as well as the latest technologies.

The next step is to use their characteristics, behaviors, and habits to plan and custom tailor your teaching strategies for them. Consider each characteristic and how one or more technology tools can draw on their specific interests, intelligences, and learning styles. You should be sensitive to their individual strengths and weaknesses and try to build on the former before helping them to compensate for the latter.

In order to provide you with an array of options, I have assembled a "Memory Jogger" of generic technology teaching strategies you can use to address the preceding Net Gener learner characteristics. You probably have used many of these methods already. They apply to most all content areas, disciplines, and educational levels. The strategies are listed in Table 1.

Table 1. Memory Jogger: Match of Technology Strategies to Net Gener Learner Characteristics

Net Gener Learner Characteristics	Technology Strategies
1. Tech Savvy	Incorporate technology meaningfully into lectures, in-class and out-of-class assignments, activities, and demonstrations; try to use *music, video clips, video games, blogs, wikis, search engines, and research databases* that are animated, image-based, and interactive; consider *multiplayer virtual environments and augmented reality* for simulations and role playing experiences; these digital tools, which are second nature to them, should be portable and easily accessible, not tethered to a particular location
2. Relies on Search Engines	Provide assignments that draw on the students' search engine skills, but give guidance and structure on how to maximize the value of the search results; give them exercises

to *think critically* about the information and how to use and interpret it; focus on *information literacy skills*; link search engines to databases for research projects

3. Interested in Multimedia	Use *music, videos, video games, other games, etc.* that are student favorites in your lectures and assignments to connect them to each other, to you, and to the content; students can learn from a wide variety of media, often simultaneously (see #1); structure assignments and assessments using *e-portfolios*
4. Creates Internet Content	Provide students with opportunities to contribute to *Websites*, write their own *blogs, microblogs, and wikis*, and also create *YouTube videos, podcasts, and videocasts* with appropriate content
5. Experiential/ Kinesthetic	Plan *games, simulations, improvisations, and roleplaying* with specific learning outcomes in live and virtual (avatar) formats, such as *multiplayer virtual environments*; allow students the chance to actively work with a variety of databases in doing research; require students to create their own *e-portfolios* of their work
6. Multitask	Consider permitting students to multitask in class; they can listen to you, type, listen to music, play an online game, and send an email or text all at the same time; *don't be offended* if their attention is divided rather than focused only on you; it may be unreasonable to expect their "undivided" attention unless you have found the right *hook*
7. Visually Literate	Include graphics, images, and visual representations in your presentations, especially *videos from TV, movies, and YouTub*e, with which students can relate; create class *demonstrations with music and parodies of TV programs, movie scenes, and Broadway shows* to illustrate a concept, theory, or procedure (a spectacular way to introduce an anxiety-producing, difficult, or boring topic); assign students to *develop visual demonstrations with music* to be performed in class, videos, or other visual products; use *multiplayer virtual and augmented reality experiences* which are immersive, animated, and 3D worlds to provide role playing and simulations; think *Avatar*; select photographic images to foster critical reflection and discussion using *photovoice* in an online community
8. Emotionally Open	Use hybrid or blended methods (live and online) to *encourage interaction and opinion sharing, such as digital storytelling* through blogs, wikis, and social media networks
9. Prefers Teamwork	Tap the students' "collective intelligence" by enabling them to pool knowledge, research, debate, share opinions, and

create new insights through *wikis, blogging, podcasts, and e-portfolios*, encourage *multiplayer virtual role playing and simulations*, apply *photovoice* to digital images to generate discussion and online collaboration; assign out-of-class small group work with an *online chat room*; use *Wiggio* to schedule meetings and group events with students; assign students to create visual *demonstrations, videos, or other products* to present in class; students will huddle outside of class, pass information around, pull material off the Internet, and interact to teach each other rather than go to class

10. Prefers Typing	Encourage students to take in-class notes and do in-class assignments on their *PCs/Macs or handheld digital gizmos*; require essays, term papers, and research reports and articles using Word or similar word processing software

As you review the strategies in the table, it should become apparent that the role of the traditional, talking-head, "sage on the stage," or broadcaster (transmitter of information) (Tapscott, 2009) in front of the classroom has shifted to group facilitator, orchestrator of collaborative knowledge creation (Brown, 2008), or "guide on the side" (Carlson, 2005). However, this shift has been occurring for more than a decade, as many instructors have been changing from "teacher-centered" to "learner-centered" teaching methods (DeAngelo et al., 2009). The research evidence has also been accumulating on all of the benefits of the latter approach in terms of student success (Cornelius-White, 2007).

Learned-centered techniques should be blended with the latest technology. If you don't change and adopt these techniques, the students may not come to class. They need to feel connected to you and to each other, face-to-face and online. Mix your methods; incorporate a variety of technology tools. The operative criteria for in-class and out-of-class activities to be successful are digital, visual, speed, hands-on, multimedia, multitask, interactive, collaborative, feedback, and connected (Berk, 2008a, 2008c). Table 1 suggests several techniques that satisfy these criteria.

Once you have leveraged the elements in your students' world and have established an in-person as well as virtual connection, you can diversify your methods and content to present elements from *your* world and discipline. For example, using hip-hop music and YouTube video clips with which students can relate to illustrate content points in class will provide the connection; then you can experiment with Mozart and clips from *A Few Good Men* or *The West Wing* to stimulate discussion on other topics (Berk, 2001, 2008b, 2009a; Eddy & Bracken, 2008; Miller, 2009). This will facilitate a multimedia balance across generations to attain specific learning outcomes.

CONCLUSIONS

After all that has been written on this topic, including my previous articles, and now adding this piece to that body of work, what can I possibly say or contribute that you don't already know? Hopefully, this piece clarified and extended the work of my predecessors in a form that fosters a better understanding of your students and how you can use technology effectively in your classroom. Perhaps a few of the suggested technology strategies will provide useful additions to your current repertoire.

The 10 Net Gener characteristics described in this article indicate that these students crave in-class and out-of-class experiences that are active, participatory, visual,

collaborative, fast moving, quick thinking, rapid responding, emotionally freeing, and spontaneous. Plan memorable learning experiences that draw on the available technology gadgets with which your students are most familiar and systematically match their characteristics. Leverage these gadgets to attain specific learning outcomes. They can serve as teaching tools to turbo-charge your learning environment to give every student the opportunity to succeed and perform at the highest level.

However, before you start charging, you need to consider your institution's support structure and culture for adopting any of the technologies you want to use. Unfortunately, the technology of Web 2.0 tools is emerging at a far greater rate than any institution's capability to adopt them. The race has begun. This conjures up the hypothetical image of distributing iPads to all of your students on the first class of the semester and requesting that, at the end of class, they drop them in the big green recycle buckets as they exit because they're already obsolete. Steve Jobs has just produced a NEW iGismo that's even better and cheaper.

Faculty, administrators, and IT staff should consider what criteria they will apply to select the technology. The criteria should be in place before faculty evaluate any tool's utility for the teachers, compatibility with available hardware, ease of use, and cost effectiveness. For these hurdles, consult Harris and Canziani's (2010) guidelines and resources. You may now delete this PDF article in this e-journal, because it's probably already out of date.

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