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Teaching the Virtual Generation

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Using Gioia and Brass' 1986 article, "Teaching the TV Generation," as a point of departure for considering our current instructional environment, we focus on a relatively recent development that once again has implications for our teaching pedagogies: that we are, in fact, no longer teaching a verbal, nor even just a visual, but now a virtual *generation of students. Technological and social changes in the wider environment can have major implications for teaching and learning pedagogies—i.e., optimal teaching and learning occur when teaching styles align with learning styles. For that reason, we consider some key learning principles in light of the learning styles of our current generation of students, who are quite facile with virtual technologies. We argue that the effective use of some electronic learning tools can provide useful and engaging means for their education by addressing this generation's preferences for virtual media while also enabling student-directed interactivity (via online searches, games, simulations, etc.). We first articulate the conceptual grounds for arguing that there has been another shift in the teaching and learning environment we now face—which implies some necessary adaptation of traditional learning principles. We then discuss: (a) some technologies and applications (mainly Internet-based tools and videogames) that can facilitate the convergence between virtual generation (V-Gen) preferences and classroom interactions; (b) some guidelines for using these technologies to fulfil these learning principles and; (c) some pitfalls that can occur and how to avoid them.*

THE RISE OF A VIRTUAL GENERATION

Nearly a generation ago, Gioia and Brass (1986) noted that the college students then being taught constituted a "TV Generation," that is, students who had been raised in an environment dominated by visual images. They suggested that these students had developed a markedly different style of learning that often was mismatched with the learning environment of the then typical college classroom. Furthermore, they argued that the advent of the TV generation had important implications for styles of teaching, because the generation of teachers then teaching employed teaching styles that were consistent with *their* learning styles, which were predominantly verbal, not visual. The essence of Gioia and Brass' argument was that both teaching and learning are enhanced when teaching styles are commensurate with learning styles, so their recommendations argued for using more visual materials in the college classroom.

Beyond their argument that teaching and learning styles should converge, Gioia and Brass, perhaps more important, noted that technical and social changes in the wider environment can have major implications for teaching and learning pedagogies. Although some fundamental principles might hold across generations, the mode of delivery of those principles probably will need to change over time. Demographers consider a human generation to be roughly 20–25 years. Toffler (1970) argued convincingly that technological generations were becoming much shorter than human generations, which had direct implications for hu-

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man ability to adapt to ever shortening techno cycles. Because nearly another generation has passed since Gioia and Brass' statement, a reasonable question is "Has there been another significant change in the last, say, 10 years that we should account for in our teaching? And, if so, does such a change imply that we should encourage a further change in teaching approaches?" Our answer is that, yes, there has been a profound change, but that the implications of the change are less clear cut than those that led Gioia and Brass to counsel the inclusion of more visual images in the classroom. This new change has come about because of the widespread presence of Internet tools, computer simulations and games, and computer-mediated communication in the everyday lives of the new generation of students. Such changes imply that we educators should explore some of the implications of the progressive shift from verbal to visual to virtual approaches to learning.

Gioia and Brass predicated their original argument on the heuristic proposition that the form of learning with which students had the most facility had changed over the 3 decades during which television had become a fixture in most households. Perhaps the most telling practical statistic at the time was that by 1984, more households had videocassette recorders (now becoming obsolete) than encyclopedias (now virtually extinct). The previous generation had been exposed to an average of over 7 hours of television *per day* (NTI survey, 1982). Personal computers did not figure in the mix.

Now they do. Since the mid 80s, personal computer ownership and use have burgeoned. Despite the rise of computer literacy by the early 90s, however, the dominant style of learning with PCs seemed to have remained essentially visual or graphic, in that images had simply been transferred from the TV to the computer screen. A major shift did not occur until the widespread advent of the Internet in the mid to late 90s. Access to the Internet is now ubiquitous in the United States and the developed world. As an example, ComScore Media Metrix reports for 2004 that in the United States, nearly 80% of the population of ages between 18 and 24 years had Internet access, with an average access time of 1300 minutes per month. The same source reports, albeit for 2002, that half of U.S. Internet users had a television and PC in the same room, opening the door for blended use of the two media (e.g., website visits related to a television show being watched; e-mail or online chatting about a show being watched; searches for TV listings or reviews; searches for products featured on a television show or in a TV advertisement).

Coincident with the Internet we also have seen a tremendous rise in the use of simulations and gaming—many of which are web-based. A recent report by the Interactive Digital Software Association (IDSA, 2005) found that, on average, one person in every U.S. household surveyed plays PC or console-based games, such as *Playstation, Wii*, or *X-Box*, and 42% of frequent gamers play online. A Nielsen/NetRatings survey (2004) shows that there are about 46 million online PC gamers worldwide and 10 million online console gamers, indicating that a rather large number of people are engaged in simulation and gaming.

TV now appears to have been overtaken on the information side by the Internet and on the entertainment side by videogames, as shown in recent research by the European Interactive Advertising Association (EIAA, 2005). Those data show that 15–24 year olds across Europe are spending less time watching TV and listening to the radio as a result of using the Internet. Forty six percent of those 15–24 instead prefer to browse the web, while 33% of those questioned are even reading less, choosing to access information over the Internet instead. Fifty eight percent of those interviewed expressed a preference for chatting with friends over the Internet rather than using other communication media. Meanwhile, 40% had visited a games website within the past 7 days, and 17% had purchased a computer game online. Overall, then, most students now have a PC, and a very high percentage of them are connected to the net and play videogames. For those of us in the education industry, especially those older than 35, these statistics are both striking and ominous. Taken together, they suggest the rise of a new generation in the prime demographic age bracket most associated with education. Simply put, we are no longer teaching a predominantly verbal, nor just a visual, but now a facile virtual generation of students.

ALIGNING TEACHING AND LEARNING STYLES

As instructors teaching the students of a new virtual-generation (V-Gen), we need to account for the changes brought by this technological revolution. We are responsible for making sure that there is compatibility between V-Gen learning styles and our teaching styles. In general, the available evidence suggests that this compatibility is less than it could be or should be, and that we need to act to avoid a disconnect between our current teaching world and the technology-rich V-Gen learning world. Some constructively provocative questions include the following: "Are there sound ways to

incorporate Internet and videogame elements into our teaching? Can such technology-influenced instruction lead to a better understanding of management and organizational phenomena for V-Gen students?" Our answer to such questions is, "yes." We therefore begin the discussion with the fundamental question: "How can we use modern technologies to improve the alignment between our teaching styles and newly developed learning styles of our V-Gen students?"

In principle, our basic premise is similar to that of Gioia and Brass (1986), that is, that effective learning occurs when students' learning styles align with in-class teaching styles. We articulate theoretical arguments and practical implementation suggestions for integrating new technologies into classroom teaching, to achieve a better alignment between students' and teachers' styles. The logic of our guiding conceptual framework is illustrated in Figure 1.

We first highlight some hallmarks of virtual technologies and their implications for student learning styles. We then describe the effects of these technologies on student cohorts already using such technologies in their out-of-the-classroom lives. Next, we describe several robust principles of effective learning and adapt them to the domain of virtual technologies. Finally, we offer several strategies and examples for leveraging in-class learning enhancement through the use of technologies compatible with teaching the virtual generation.

HALLMARKS OF VIRTUAL MEDIA

Because of the widespread diffusion of Internet and videogame use among the student-age population, and their probable effects on learning content and style, we as educators need to understand the key features and implications of these media that might affect students' learning inside and outside classrooms. First, it is clear that the Internet allows students to engage in a wide variety of activities because of the characteristics of the Internet architecture itself. Internet technologies can be classified as follows (cf. Morris & Ogan, 1996): (a) *asynchronous download*, characterized simply by people seeking out a site to access information (e.g., websites, FTP sites); (b) *asynchronous communication* one-to-one, one-to-many, many-to-many (e-mail, forums, listserves); (c) *synchronous communication* one-to-one, one-to-many, many-to-many (chats, Instant Messaging, audio conferences, online competitive gaming, peer-to-peer file sharing). Because of these technologies, students are able to stay connected to news and information in real time, to search for information in various formats (text, audio, video, interactive contents), and to communicate with peers via mail, chats, and voice-over-Internet protocol (VOIP). The easy availability of these connections implies that students need never wait for information and need never be disconnected from peers in their virtual networks for very long.

Burgeoning Internet usage has now produced among V-Gen members the widespread "Internet culture" forecast by Kiesler (1997) and Gackenbach (1998). The key features of this culture that are of importance to educators include connectivity, redundancy, free information (and lots of it), speed, self-pacing, snowballing (pursuing thought threads from hyperlink to hyperlink) and impersonal interactivity. At the heart of this virtual generation is the notion of virtual interactivity (interacting with others via computer technology, and/or interacting with the software itself, such as

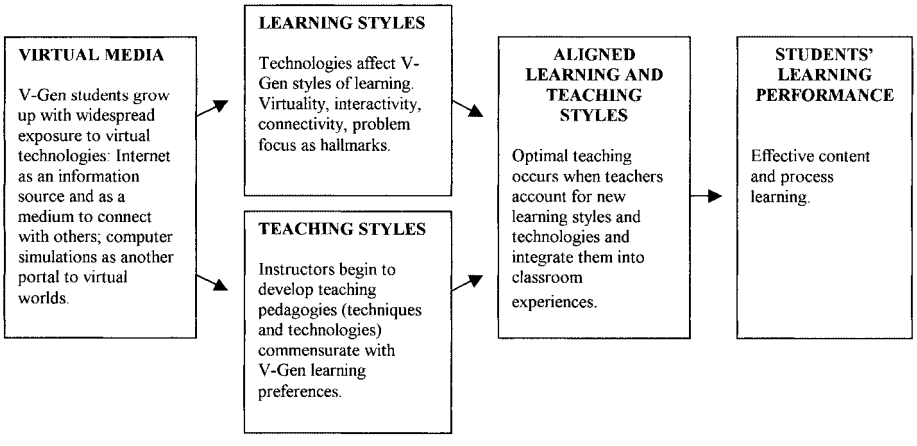

FIGURE 1
Alignment Between Learning and Teaching Styles

videogames). Contrary to the popular impression, this is not a passive generation, but one that fully expects to interact with and participate in their culture. Theirs is, however, essentially a culture that also emphasizes immediacy (24/7 information availability), curiosity, and intellectual openness (Tapscott, 1998).

Videogames might constitute a relatively small part of the Internet universe, but they nonetheless represent a notable means by which information is processed and absorbed by V-Gen users. "Gaming interactivity" is different than "website interactivity," however. Games provide an immersion environment with the opportunity to act within, and interact with an augmented and challenging reality, while the player actively searches for solutions to problems (Gee, 2003; Prensky, 2001). Games provide extraordinary domains wherein learners discover new ideas and solutions to interesting problems through semistructured experiences. As important, players must actively engage the game, and can only succeed by figuring out the "rhetoric" or "grammar" of the game (i.e., the cause–effect relationships among actions taken in the game and results) and assimilating it into their working schemas for dealing with context-specific problems. Previous generations of games demanded little in the way of concept formation, mainly requiring quick reflexes or simple mental models. The latest generation of games, however, are considerably more complex and demanding. These games are more open-ended and allow multiple strategies, thus opening a pathway to critical learning (cf. Bruner, 1977). A player is first introduced to the simplest concepts and then proceeds through increasingly complicated challenges. These challenges are often arranged so the player has a strong sense of progressive learning. Each new level can involve developing new game-relevant abilities and practicing those abilities to achieve skill mastery.[1]

Simulations and games clearly hold promise as teaching vehicles, but to be useful as learning vehicles they need to have some beneficial hallmarks. First, "omomorphism" is a key feature. *Omomorphism* means that a real environment, characterized by a certain number of distinctive traits (n), is described through a number of variables (m) that is lower than the original environment ($m < n$), without losing much information useful for instructional purposes. This complexity reduction process can hinder the simulation's face validity, however, so our "heuristic questions" for choosing a good business simulation game are (a) is it based on good educational principles?; (b) is it framed around an engaging story?; (c) does it put some mystery and continuity into the simulation story?;[2] and (d) does it lend itself to conducting a good "pre-briefing" of the simulation (oral or written) so that the student can run the simulation *and* be prepared to learn from it?

Overall, V-Gen students clearly spend a considerable amount of time using the Internet or playing videogames. Their increased exposure to these media and technologies is likely to be influencing their learning styles. The obvious implication is that those learning styles need to be accounted for if we hope to maximize their learning in classroom settings.

EFFECTS OF VIRTUAL TECHNOLOGIES ON LEARNING STYLES

The virtual environment can actually create different and perhaps better opportunities for learning, so long as we recognize and account for the fact that the nature of the virtual teaching and learning experience is different. There is a common feeling that the available technology is so capable that it *should* lead to dramatic new learning possibilities. Yet, these technologies and their associated virtual learning systems (VLSs) often behave in ways that confound our expectations. Virtual communities, for instance, sometimes have been employed as supplements to traditional classroom activities and have been supported by groupware tools to serve as web-based forums, chatrooms, and infor-

[1] We define Internet and videogames as virtual media. We contrast virtual media and more traditional media such as TV via the concept of interactivity. This concept highlights the different stimuli to which participants are exposed. Interactivity, in virtual domains, can be roughly defined as the capability of the software to react to users' actions. A continuum between a total lack of interactivity and full interactivity can be envisioned. Television is a medium characterized by low interactivity. Users can select channels, but they have no influence on storytelling or in searching for more detailed explanations of the broadcast topic. Internet and videogames, however, are characterized by high levels of interactivity. People connected to the Internet interact with browsers that have hypertextual logic. The Internet can be represented as a connection among a myriad of information sources with different levels of information breadth and depth. Internet-based communication tools allow interaction among groups of people via text, voice or video. Videogames (or business simulations) aim to reproduce complex worlds. They react to users' commands and incorporate evolutionary rules, with an ability to change the environment into which users are inserted.

[2] One of Shigeru Myiamoto's secrets in inventing the *SuperMario* and *Zelda* games was that, once started, people did not seem to be able to quit them.

mation repositories. How effective are these tools? Some simple, but revealing statistics suggest that VLS availability by no means implies VLS use. In one leading European university, for instance, 170 courses during a recent session were provided with groupware tools, at the instructor's request. Of these 170 classes, 110 had zero messages over the course of the semester (i.e., neither the instructor nor the students posted any discussion points). Of the other 60 courses, the average number of students was 100; but the average number of messages in 3 months was 50 (average ratio of messages per student, 0.5). In the mathematics course, 1500 messages were posted; in the basic management course, 150 messages were posted (one per person). Clearly, the available technology was underutilized. Even such simple anecdotal evidence highlights the need for compatibility between V-Gen habits and the way technology is employed. Although the technology was well known by the students, nobody bothered to use it, either because of the lack of interesting items posted on forums or because of the lack of interaction between course content and support offered by technologies (cf. Brower, 2003; Piccoli, Ahmad, & Ives, 2001).

It is clear that the students we are now teaching know perfectly well how to access information on the Internet, because they can "Google" anything or anyone anytime. Yet, they sometimes have trouble remembering the content of their Google searches, and recognizing trustworthy sources, to the point of even being able to distinguish between advertising and fact (Graham & Metaxas, 2003). For these reasons we view experience with the Internet as a double-edged sword: It confers ready access to a wealth of information, but also encourages uncritical acceptance of the information provided, thus emphasizing information's availability rather than its quality. Furthermore, this deficiency does not appear to be self-correcting with increased Internet experience, as Graham and Metaxas also found that accurate evaluation of information was independent of the number of years a student had used the Internet.

Despite such pitfalls, this technology-enabled style of learning also has some encouraging tendencies. For instance, it has some of the essential features of double-loop learning, in that it is focused less on content and more on the logics and processes underlying a subject of study (e.g., management) or other kinds of complex problems (Argyris, 1982). Anecdotally, we have noticed that this type of "deutero-learning" so far appears to be more common in undergraduate classrooms than in graduate classrooms, although we suspect that difference will soon disappear as the new generation segues into our MBA programs. We believe that this shift (from concepts to relations-among-concepts) is partially engendered by the familiarity the younger generation has with ways of collecting and processing information that are common to Internet use and simulation/game designs.

V-Gen students are accustomed to sitting down in front of their videogame consoles and engaging in an immersive experience in which they control many features of the virtual world. For that reason alone, professors should not be surprised to learn that students will find a typical classroom experience less dynamic and less interesting by comparison—a point noted by Gioia and Brass (1986) in comparing TV watching and classroom experiences. They were referring to the shift between the verbal and visual generations; the comparison pertains to the virtual generation as well. In general, then, we would characterize our new generation of students as learning in a somewhat different way than the previous verbal or visual generations. Table 1 offers a comparison of past and current generation learning styles (cf. Tapscott's 1996, 1998 work on pedagogy). We have stated these comparisons in more discrete and mutually exclusive terms than is actually the case, but nonetheless they help to demonstrate that a qualitative shift in learning approaches is occurring, and this implies a commensurate necessity for a shift in our teaching approaches. Students now expect rich, interactive, and even "playful" learning environments.

From an instructor's perspective, we see two rather stark and disparate options in response to these recent learning styles trends. First, we could demand that students continue to learn fixed bodies of instructor-provided information. Students would then still learn how to connect information and they would depend on instructors to fill holes in knowledge with the correct contents. The "sage-on-the-stage" model would then still have the most prominent place in the teaching spectrum. There are some obvious drawbacks to this approach; students find it more difficult to develop critical-thinking and problem-solving skills if instructors continue to emphasize the transmission of fixed bodies of information (Bok, 1986; Boyer, 1987; Alavi, Yoo, & Vogel, 1997). Our new generation of students would continue to have difficulty in integrating and applying knowledge from various domains to practical situations.

A second approach would capitalize on the features of students' preferred learning styles to enhance their learning. Virtual generation students seem to be facile in making connections, but they do not seem to know which connections to make

(Graham & Metaxas, 2003). For that reason, our role as instructors would become one of identifying useful webs of relations and of providing the basic rationales for understanding the importance of those relations. We agree with Tapscott (1998) that the instructor's role should evolve beyond the traditional information transfer figure (the "sage on the stage") and even beyond the facilitator figure of the experiential and e-learning literature, to encompass something akin to becoming an "intelligent search bot" —one who serves as a guide for teaching ways to search for and recombine information and knowledge. Of course, we are not suggesting that we downplay the importance of providing useful content to students, because content helps them to remember critical concepts. We are persuaded, however, that the intelligent-search-bot approach makes it necessary to provide students' even more "absorptive capacity"[3] than in the past, before emphasizing the understanding and retention of the web of relations. Obviously, we would lobby for some version of the second approach, fostering ways to use information technology to support the V-Gen's learning processes.

What is most clear is that new technologies are here to stay. Although virtual media are constantly changing, they are not changing in ways that imply any sort of reversion to previous learning styles. The consequence is that our teaching/learning environment has shifted, and our constituents have changed ... so we must adapt our approaches to the business of teaching. We teach directly analogous points about organizational change in our own domain of management education, so there is a certain poetic justice in calling upon us to adapt as well. Only in this fashion can we maintain some kind of teaching–learning convergence. Fortunately, the required change is not as dramatic as the apparent mismatch of features between traditional learning and virtual learning would imply. There are a number of important precedents in our currently available teaching pedagogies that give us some insight into how we might perform a transformation that is more easily within most teachers' skill sets.

ADAPTING TEACHING TO VIRTUAL GENERATION LEARNING

In light of the foregoing discussion, we suggest a set of guidelines that can enable us to better match V-Gen learning styles with our teaching styles. To provide usable suggestions, we first note some important general principles from the learning literature and then propose ways of adapting them to V-Gen preferences. We highlight three features associated with effective learning that have implications for teaching the virtual generation: (1) active involvement by students in the learning process, (2) facilitative social settings, and (3) problem-solving focus (Alavi, 1994; Alavi, Wheeler, & Valacich, 1995; Johnson & Johnson, 1975).

First, *effective learning is an active and constructive process* engaged by the user (Shuell, 1986). Learning, therefore, is better accomplished when students are dynamically engaged in the knowing process, including the production, analysis, and elaboration of information relevant to them. For the virtual generation, however, students are more accustomed to a "lonely" search mode and apparently value this search style as a desirable hallmark of cyberspace and virtual reality. Instructors integrating Internet use and simulations or games into classrooms need to consider ways of accommodating this lonely search style and keeping students focused on a specific assignment (i.e., discouraging the temptation to engage in meaningless Googling).

Second, *effective learning has most often been construed as a social activity* (Vygotsky, 1978), facilitated by initial knowledge sharing and followed by individual internalization and personalization of the knowledge (Brown & Palincsar, 1989). In a context of traditional collaborative learning through discussion, conversation, and comparison, students develop interpretations and personally relevant solutions to a given problem-solving situation. The "social" dimension for V-Gen students, however, takes on an interesting twist, in that learners frequently are not colocated. They are, however, "virtually connected," so they can create a virtual community that serves a social purpose (witness the ubiquity of communal discussions via Instant Messenger). Moreover these students are comfortable with a certain degree of anonymity or, at least, a lack of nonverbal cues, that recast the concepts of identity and physical appearance, that is, they pay more attention to social reputation based on competencies assessed via "reciprocal reconnaissance" (checking each other out remotely, especially in webchats or forums, where the participants have *never* met, and might never do so).

Third, research shows that the *learning of general problem-solving strategies is facilitated by practical resolution of complex problems* (Pellegrino & Glaser, 1982; Resnick & Glaser, 1976), a

[3] We use a bit of academic license in borrowing Cohen and Levinthal's (1990) concept and translating it to the individual level.

feature especially appropriate for the complexities facing this generation. As noted, these students are accustomed to assuming a process view, rather than a content view (Tapscott, 1996, 1998), when searching for information and solving problems. Their concept of complexity is thus focused less on memorizing information and more on developing rules to solve problems linked to information abundance. All these new takes on old learning principles imply a shift that augurs a change in our teaching tools and the ways we use them as instructors.

Integrating virtual pedagogies (Internet and interactive simulations) to support the venerable face-to-face classroom not only helps to tailor our teaching styles to our students' learning styles, it also broadens the boundaries of our "teaching space." Brower (2003) and Simonson, Schlosser, and Hanson (1999) suggest that we can enhance the learning experience if we can produce a "touch effect" with technology—creating the sense of personal involvement and interaction via technology. The implication here is that virtual learning is likely to be more effective if it can emulate some form of the dynamics present in a traditional classroom. We believe, however, that touch effects should not only be emulated, but also integrated into pedagogies for teaching V-Gen students. Again, our fundamental question is this: "How can we use modern technology to improve learning in an in-class environment more attuned to V-Gen students?" Addressing this question would enable us to facilitate students' learning in a fashion attuned to their learning styles, while improving on the advantages of traditional teaching pedagogies.

THREE LEARNING GOALS FOR USING NEW TEACHING TECHNOLOGIES

In incorporating new technologies into our teaching, we want to fulfil three primary goals that can satisfy V-Gen preferences *and* achieve effective management learning. We would like students to develop these important skills:

1. an ability to make content connections (via effective hyperlink navigation) to foster effective learning as an active and constructive process,
2. an ability to make useful interpersonal connections (via communication technologies), to foster the social side of collaborative learning (Vygotsky, 1978), and
3. an ability to understand complex interdependencies among different domains (via simulations or games) to foster the problem-solving aspects of effective learning.

Table 2 summarizes the correspondence between these three primary learning goals and the technologies we suggest to accomplish them (along with other characteristics that are important to achieving the expected outcomes of technology in the V-Gen learning process). In particular, column four ties learning goals to the V-Gen learning characteristics described in Table 1. The remaining columns provide technology examples, summarize instructor roles, and provide a synopsis of advantages and disadvantages in using this approach. Next we discuss an approach to achieving in-class technology integration.

The virtual technologies aimed at achieving our three learning goals are actually quite straightforward and already are a part of most students' computer hardware and software architecture. The focus, therefore, is not so much on technology per se, but on the way in which technology is accepted and used in the relationship between students and instructor or among students. We focus mainly on Web search engines, knowledge portals, groupware tools, and computer simulations or off-the-shelf videogames, all of which can facilitate learning. Search engines are marvellous information-access tools, so long as clear search rules are used; knowledge portals can be effective in explaining the concept of trustworthy sources; groupware tools may help in shaping the rules for effective business communication; and simulations are powerful tools for explaining connections among variables or theoretical domains.

The information science literature gives us some insight into the factors that lead to successful technology adoption in the classroom. The most important of these factors derive from the Technology Acceptance Model (Venkatesh & Davis, 2000) and

TABLE 1
Comparison of Previous vs. Current Learning Styles

Characteristics, Dominant Learning Style of Previous Generations	Characteristics, Dominant Learning Style of Virtual Generation
Linear acquisition of information	Nonlinear (hyperlinked) logic of learning
Focused mainly on facts and knowledge acquisition	Focused more on deutero-learning (learning how to learn)
Guided learning	Autonomous learning
Learning in specified time periods	Learning 24/7
Face-to-face learning	Interactive virtual learning
Learning as Duty	Learning as Fun
Rote learning	Analogical learning

TABLE 2
Three Learning Goals in Integrating Virtual Technologies into Classroom Teaching

Learning Goals	Main Learning Principle to Be Fostered	Applicable Technology	Fit With V-Gen Learning Characteristics (see Table 1)	Examples	Role of the Instructor	Advantages/Disadvantages
Ability to make hypertextual content connections	Students' active involvement	Internet sites and search engines	Hyperlinked logic of learning; Autonomous learning; Learning as fun	Viable (trusted) websites; judged by the instructor	"Intelligent search bot"[a]	Fit with typical student activities; Googling is not always good
Ability to make (virtual) interpersonal connections	Students' social interaction	Groupware	Learning 24/7; Learning as fun	SameTime; Skype; LearningSpace; BlackBoard	Discussion and learning facilitator	Basis for a more conscious, efficient and effective usage of computer-mediated communication technologies to solve business problems
Ability to make complex interdomain connections	Students' complex problem solving	Business simulations or games Off-the-shelf videogames	Interactive virtual learning; Deutero-learning	EIS; FirmReality; Virtual Leader; Marketplace Civilization; ThemeHospital; TheSims; SimCity	Theory-to-practice applications guide; Virtual role-play facilitator; Simulation designer	High interactivity level; Helps to suggest how different theories fit together; Realistic practice involving theoretical concepts; Fun and engaging; Not many games off-the-shelf with theoretical characteristics compatible with specific OB-OT-Strategy topics; Hard to design and test original simulations

[a] A person who serves as a guide for teaching ways to search for and recombine information and knowledge.

the Task-Technology Fit model (Goodhue & Thompson, 1995). The former is based on the premise that technology acceptance is mainly tied to ease of use and perceived usefulness. The latter is based on the notion that tasks and technologies need to be compatible. More important, both depend more on how instructors design classroom experiences rather than on the technology itself.

Learning Goal #1: Facilitating Students' Ability to Make Content Connections via Hyperlinks

We know that V-Gen students are well attuned to using websites and search engines in their day-to-day activities, so we recommend developing learning-related activities to take advantage of these skills. In particular, we use web work as a vehicle for learning conceptual content and linking that content to practice. As an example, assume that you want students to focus on hiring practices in real companies and that you want to enhance their involvement through technology. You can provide students with the basic theoretical principles of effective selection and hiring on a course Intranet website and then ask them to search the net and post to a chatroom site their reports of currently used criteria for employees in different clusters of firms (consulting companies, hi-tech firms, new economy organizations, etc.). Commercially available electronic course management "shells" such as *Blackboard*[4] have the ability to record and keep track of such information. During their learning activities about this topic, students translate some "memory needs" into "linkage needs" and establish the necessary connections among concepts. Individual postings to the chatroom trigger the exploration of new nodes, new connections, and new linkages via snowballing techniques that produce hyperlink-to-hyperlink connections on the net. The technology remembers information by keeping track of the path (Internet favorites, spidering activities,[5] forum posts, etc.).

In class we discuss the results of the guided web search and debate the skills required by various companies (either face-to-face or via chatroom features). We check out the best sites found by the students, which were previously posted on our class-related forum. In class, we access the sites "live" to discuss their pros and cons. In particular, we focus on effective and ineffective Googling styles, quality of information sources, and site trustworthiness. By these straightforward procedures we take advantage of students' Internet search experience while simultaneously enhancing their learning.

Learning Goal #2: Facilitating Students' Ability to Make Interpersonal Connections

V-Gen students frequently engage in lively computer-assisted communication with friends, with whom they can be virtually in touch 24/7. Traditional school settings strike them as pedestrian by comparison, with groupwork often set up on inconvenient and narrowly pre-defined schedules. Readily available groupware programs alleviate this problem and enhance students' learning possibilities in ways that take advantage of their facility with virtual technologies. Groupware tools are the basis for creating what Alavi and Leidner (2002) term "computer-mediated contextual interactivity," which simply uses computer-mediated communication (CMC) to create an interactive environment among people. Instant messaging, audioconferencing, videoconferencing, forums, and file and application sharing are all examples familiar to many students. When managed well, CMC has proven its effectiveness as an alternative communication medium, compared to traditional face-to-face environments (Brower, 2003; Alavi, 1994; Webster & Hackley, 1997).

Through groupware technologies it is possible to create effective virtual learning environments in which the learners' interactions with instructors, peers, or learning materials (e.g., assignments, exercises, and tests) are totally or partially mediated through technology. Using these technologies allows us to recreate a familiar virtual environment for V-Gen students that satisfies another principle of effective learning: learning as a social activity (Vygotsky, 1978; Brown & Palincsar, 1989). Again, the key to effective groupware use is to capitalize on its high "touch effect" potential, raising the interactivity level and, thus, the learning results (Brower, 2003; Arbaugh, 2000; Bigelow, 1999). To do so, we suggest, first, that instructors devote some time to designing engaging tasks, with high "fun factors." Second, we know from recent work on dispersed teams that there can be a negative relationship between teamwork quality and team dispersion. In particular, the quality of traditional teamwork (good coordination processes, members' mutual support, cohesion, etc.) is hindered by physical distance between team members unless special care is taken in teaching good virtual communication skills (Hoegl & Proserpio, 2004). Group-

[4] www.blackboard.com

[5] *Search Spider*: A program that automatically discovers, downloads, analyzes, and indexes web pages related to a specific topic.

ware is, therefore, not a panacea; even students experienced with CMC need to be taught rules of effective communication and coordination for business environments.

As an example, in our classrooms we use some exercises tied to computer-mediated communication. We usually discover that although students are accustomed to web-chatting, they are not accustomed to the process of analyzing managerial problems with CMC tools. One of the authors, therefore, has designed a playful simulation that encourages students to learn the basic principles of remote coordination. He uses a murder case and provides instructions to 5-person groups to discuss and solve the case only through chat and forum tools, albeit in a class setting, where it is easier to monitor the students' efforts. After this exercise he provides a short debrief, including a discussion of information sharing and decision making in a virtual environment. We draw our theoretical basis for discussion from media richness theories (see Daft & Lengel, 1986, or Büchel, 2001) and from writings on detrimental effects in mediated contexts (e.g., Trevino, Daft, & Lengel, 1990; Hoegl & Proserpio, 2004). Students appreciate the hands-on experimentation with coordination technologies and easily overcome the feeling of low confidence with technological tools. To drive home the learning, the simulation can be enhanced with a second step, in which we depart from the murder case, proposing a simple organizational case with blended coordination mechanisms. Here virtual sessions alternate with face-to-face discussions.[6]

Learning Goal #3: Facilitating Students' Ability to Make Complex Inter-Domain Connections

The aim of introducing interactive simulations in class is to enhance students' understanding of connections among theories and variables, while framing the learning as play rather than work (in the spirit of Tom Sawyer convincing his friends that whitewashing a fence was fun, not work). The most interesting aspect of simulations, however, is their ability to provide students with a predefined web of relations and the basic rationales for understanding the importance of those relations. As an example, one of us teaches the basic principles of "organizational capabilities" via simulation. Organizational capability is often a difficult concept to teach because it comprises many subconcepts, and the subconcepts are related through many interdependent relationships. To solve the learning dilemma, we can use a computer simulation to provide a forum to experiment with developing organizational capabilities.

A number of writers argue that the potential for using the computer as a learning tool increases if we involve users in a simulation process that is intended to replicate important dimensions of a real application (Gee, 2003; Kalawsky, Bee, & Nee, 1999). Students deal, for instance, with market analysis, strategy formulation, and management of strategy, with immediate feedback concerning their actions. We believe there is substantial potential for simulation tools to enhance the compatibility between the virtual generation and theoretically based learning, because simulations can embed principles in a form that allows V-Gen students to apply their preferred learning styles to realistic situations.

Refinements to simulations have been extraordinary in recent years. Even Formula 1 racing drivers, for instance, now use readily available game simulation software (*Grand Prix* or others) to realistically learn tracks on which they have not yet driven, for example:

> Montreal is another new track for me to race on . . . In order to prepare myself for the circuit, I have been spending quite a lot of time on my PlayStation. It definitely helps knowing the track in advance so that you know what to expect on your initial laps (Christian Klien, Formula 1 driver).

Similarly, U.S. Marines play *Quake* and *Unreal* to simulate missions in which they could be involved. Likewise, a number of business simulation games now are used as learning support tools in management education (e.g., the *EIS* simulation has been developed at INSEAD in France to simulate organizational change, and *FirmReality* has been developed at Bocconi University in Italy to study the integrated use of organizational capabilities to gain competitive advantage). *Virtual Leader* is a commercially available simulation that uses avatars that vary their responses to changing players and decision conditions. *Marketplace Business Simulations* is another commercially available program that mimics a hypercompetitive marketplace. The best off-the-shelf videogames are procedural representations of systems that allow students to combine system variables to generate

[6] The technical setting required for creating virtual environments is straightforward. Chat and forum tools are usually embedded into distance-learning platforms that are now common in universities (e.g., Saba, LearningSpace, and the previously cited Blackboard). Free software can also be used (e.g, Messenger for chat purposes and Skype for audio-video conferences).

higher level effects and dynamics. As an example, *Theme Hospital* or *SimCity* allow students to understand how patient or stakeholder satisfaction affects general performance indicators, such as hospital revenues or city development. Games like these can enhance the learning impact of traditional lessons, *if* instructors guide student reflection on the managerial principles when they play. They can also enhance the level of complexity confronted by students, raising their skills in facing multifaceted and complex problems.

To reiterate, there is some consensus among traditional and contemporary researchers about key attributes of effective learning systems. Gee (2003), Gorrel and Downing (1989), and Torney-Purta (1993), for instance, all note the advantages of an interactive approach for learning effectiveness. For these reasons, risk-free, interactive simulations, in which it is possible to play, experiment, and learn, are, in our view, a good fit with the out-of-classroom experience of V-Gen students. We use simulations in the classroom as a natural tool to bring to life problem-solving aspects necessary for an effective learning environment (Pellegrino & Glaser, 1982; Resnick & Glaser, 1976). Even in self-paced simulations, however, instructors are still important because of their ability to shed light on the complex web of relations underlying simulated problems.[7]

CONCLUSION

The last few decades seem to have produced a shift in preferred learning styles that have progressed from verbal to visual to virtual. The most pressing new question for those of us in the education industry is "how might we best teach our new virtual generation students?" We have focused on learning concepts and technologies in an attempt to shed some light on the use of electronically mediated learning environments that might better align with the learning styles now common to V-Gen students. The hoped-for outcome of modern telecommunication and simulation technology is, of course, more effective individual and group learning. Excellent results are possible if we understand and account for some basic learning principles and dynamics that can increase the effectiveness of these technologies.

Interactivity and user involvement are the key elements in success. Interface graphics and wow-factors might be important, but they are not sufficient. We suggest integrating some engaging information search, some "virtual group" activity, and some intriguing problem-solving orientations into a gaming/simulation experience to create effective learning vehicles for the computer-savvy virtual generation. The effort required to implement effective high-tech learning experiences is not trivial, but it is also not beyond the learnable skill set of most instructors. Indeed, the investment required is comparable to that of any new course preparation, except that the time required is not devoted to developing content, but rather to developing process skills in working with computer simulation and some Internet-based technologies. We believe it is well worth the effort to be able to connect with our latest generation of students in their own "language."

The V-Gen teaching approach relies on instructor creativity. The most important step is developing a commitment to the value of the approach, followed by some thought devoted to ways to best blend technology with the traditional classroom practices. Thinking about these issues has made us better teachers. Students come out of our classes with a better understanding of organizational concepts and especially the relationships that tie them together *because* we have implemented teaching styles that are more commensurate with their learning styles.

[7] Further information on business games can be found at such websites as: http://www.calt.insead.edu/eis/ and http://www.cesim.com/

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