

# Educating the Net Generation

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Diana G. Oblinger and James L. Oblinger, Editors



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# Educating the Net Generation

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# Learning Spaces

**Malcolm Brown**

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New ideas about learning spaces represent a significant opportunity for higher education to make learners—and learning—more successful. Through the application of information technology, today's learning spaces have the potential to serve the new learning paradigm and at the same time meet the needs and expectations of the most recent generation of students: the Net Generation. Since education is the core mission of higher education, learning and the space in which it takes place are of the utmost importance. In order to best serve the educational enterprise, we must design learning spaces that optimize the convergence of the Net Generation, current learning theory, and information technology.

This chapter establishes the links between Net Gen students, learning theory, and IT, showing their relevance to the concept of learning spaces. The definition of learning space has become broader and much more inclusive over the past decade. Learning theory will be discussed, as well as its implications for both Net Gen students and learning space design. The ties between this new conception of learning spaces and the habits and characteristics of Net Gen students will be established. Finally, scenarios will illustrate what these new spaces might look like.

## What Are Learning Spaces?

What does the term *learning space* mean? Why not use *classroom* instead? As recently as a decade ago, classrooms were the primary locus for learning in higher education. Other spaces included the library, the faculty office (for individual mentoring), and perhaps the café in town. But classrooms were by far the single most important space for learning.

Since then, a great deal has changed. The World Wide Web has emerged as the primary way most people use the Internet. The Web has spawned a wealth of new, network-based applications, from digital music stores to new venues for scholarly publishing. Indeed, the availability of network access, in one form or another, is today almost taken for granted. Handheld devices have acquired a

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growing set of functions, providing a telephone, a digital camera, and an operating system running a variety of applications. Laptop prices have declined while increasing in functionality—to the point that their use exceeds that of desktops for most students.

In parallel with these developments in IT, an entire generation of learners has grown up using computers and other networked devices. While for previous generations IT was a kind of exotic overlay or an optional tool, for the Net Generation student IT is essential. It is clear that IT and Net Gen students have had a mutually influential—almost symbiotic—relationship. The characteristics of Net Gen students mesh very closely with IT and IT’s increasing mobility, its 24 x 7 availability, and its increasing value as a communications tool. Net Gen students are social and team oriented, comfortable with multitasking, and generally positive in their outlook, and have a hands-on, “let’s build it” approach—all encouraged by the IT resources at their disposal. Net Gen students have embraced IT, using it in ways both intended and unforeseen by programmers. Their rapid and enthusiastic adoption of IT has in turn influenced its development, particularly with respect to Web-based services.

## The New Classroom

These developments impact the locus of learning in higher education. The notion of the classroom has both expanded and evolved; virtual space has taken its place alongside physical space.

Over the past decade, higher education has invested millions of dollars in classroom technology. The addition of document cameras, DVD players, Internet access, and projectors (to name a few) has added new functionality to the classroom. It is now possible to bring much more diverse materials to the classroom, to present them in a variety of ways, and to devise new classroom activities for students. As a result, the concept of the classroom has expanded to include this set of new functions.

These new classroom capabilities have, in turn, sparked interest in new pedagogical approaches. Wireless networking, for example, makes real-time or synchronous interaction (such as real-time polling) among all class participants a very real (and increasingly practical) possibility. Videoconferencing makes it feasible for an invited expert from a remote institution to join a class session. Discussions, notes, and other in-classroom events can be captured and disseminated for further study. It is important to note that these approaches mesh well with the

habits of Net Gen students, such as their enjoyment of social interaction, their preference for experiential learning activities, and their use of technology. In these and other ways, technology acts as the lever that makes it possible to develop new and more effective pedagogies. Hence the classroom and the activities associated with it are evolving.

The resources used in higher education are increasingly digital and delivered via the network. In addition, network connectivity is increasingly portable. These two developments make it possible for learning to happen informally, in areas outside the traditional classroom, library, and faculty office. Student project teams can meet outside on the green, in a lounge, in any campus café—and they can meet almost any time of day. With wireless networking, numerous digital devices, and longer battery life, we are closer than ever to realizing the goal of fully ubiquitous access. This means that learning, too, can occur any time and anywhere.

Net Gen students, using a variety of digital devices, can turn almost any space outside the classroom into an informal learning space. Similar to the traditional classroom, educators have an important opportunity to rethink and redesign these non-classroom spaces to support, encourage, and extend students' learning environment.

## Virtual Space

These changes catalyzed by technology make it clear that the term classroom, at least in its traditional sense, can no longer encompass where learning takes place. Equally obvious is that the space in which learning takes place is no longer just physical; it is virtual as well. The virtual space is an entirely new environment. *Virtual space* is any location where people can meet using networked digital devices. We should understand virtual space in its widest sense, referring not just to synchronous, highly interactive functions (such as chat, blogs, and wikis) but also to asynchronous functions such as e-mail and discussion threads.

Unlike physical spaces, virtual spaces come and go. They can be spontaneous as well as deliberate, synchronous or asynchronous. Participants and their relationships in the virtual learning space can shift rapidly. Participants can also multitask, “inhabiting” more than one virtual space at a time. As networking technology matures and costs for devices such as laptops and handhelds decline, these virtual spaces play an increasingly larger role in all aspects of higher education.

Again an IT-based function—virtual space—meshes closely with Net Gen characteristics. Net Gen students are mobile, as is virtual space. Net Gen students

are facile at multitasking and moving back and forth (sometimes rapidly) between real and virtual spaces. Net Gen students are comfortable with the fast tempo that this kind of multitasking implies. In short, virtual space is tailor-made for the work habits of Net Gen students.

It is clear that the virtual space is taking its place along side the classroom and other physical locations as a locus for learning. The result is that we are compelled to expand our concept of where learning occurs. Learning spaces encompass the full range of places in which learning occurs, from real to virtual, from classroom to chat room.

## Learning Theory

A shift in the teaching and learning paradigm is well under way, moving away from a transmission paradigm to a constructivist paradigm. In 1900, basic literacy skills included reading, writing, and calculation. *Knowing* meant being able to remember and repeat, which was appropriate to an industrial age in which practices changed slowly (at least by today's standards). Workers anticipated having a single profession for the duration of their working lives. Education was based on a factory-like, "one size fits all" model. Talent was developed by weeding out those who could not do well in a monochromatic learning environment.

The postindustrial age is characterized by rapid change. Literary skills now include critical thought, persuasive expression, and the ability to solve complex scientific and organizational problems. Knowing now means using a well-organized set of facts to find new information and to solve novel problems. In 1900, learning consisted largely of memorization; today it relies chiefly on understanding.

This shift has come about partly due the emergence of a constructivist theory of learning. Stated simply, this theory holds that learners construct knowledge by understanding new information building on their current understanding and expertise. Constructivism contradicts the idea that learning is the transmission of content to a passive receiver. Instead, it views learning as an active process, always based on the learner's current understanding or intellectual paradigm. Knowledge is constructed by assimilating new information into the learner's knowledge paradigm. A learner does not come to a classroom or a course Web site with a mind that is a *tabula rasa*, a blank slate. Each learner arrives at a learning "site" with some preexisting level of understanding.

Knowledge exists at multiple levels, ranging from novice to expert. It is the sophistication and depth of this understanding that differentiates experts

from novices. Experts have a deep and rich set of well-organized facts, as well as the capacity to use that understanding to solve problems in their fields of expertise. Novices lack that depth and, as a result, have a much harder time solving problems.

The constructivist theory has important implications. The theory implies that learning is best served when it is:

- ▶ **Contextual**—taking into account the student’s understanding
- ▶ **Active**—engaging students in learning activities that use analysis, debate, and criticism (as opposed to simply memorization) to receive and test information
- ▶ **Social**—using discussions, direct interaction with experts and peers, and team-based projects

Problem-based learning, which encourages learners to construct knowledge based on the experience of solving problems, is significantly different from methods such as recall and repetition. This is but one of many ways the older, traditional teaching paradigm contrasts with the learning paradigm. Table 1 summarizes some (though by no means all) other important ways these two paradigms differ.

Learning science research also highlights the importance of learner engagement, or as the American Psychological Association describes it, *intentional learning*.<sup>1</sup> This means that learners must have a “metaperspective” from which to view and assess their own learning, which is often referred to as *metacognition*.<sup>2</sup> An active learning environment provides the opportunity to assess one’s own learning, enabling learners to make decisions about the course, as well as reflect on and assess their progress. In the past, the measure of learning was the final grade (a summative measure). But a final grade is merely a measure of the student’s performance on tests. It does not measure the learning that did—or did not—take place. To encourage learning, summative testing or assessments must be combined with formative assessments. Formative assessment is not directly associated with the final grade; it helps learners understand their learning and make decisions about next steps based on that understanding.

## Net Generation and Learning Theory

As with IT, there are overlaps between the working characteristics of Net Gen students and practices that research has shown encourage and strengthen learning. For example, the Net Generation is social. They like to stay in touch with peers (and even parents!). They have a preference for group activity and working in teams. This dovetails with research indicating that learning is encouraged when

**Table 1.** Differences in the Teaching and Learning Paradigms

Traditional Paradigm “Teaching”	Constructivist Paradigm “Learning”
Memorization	Understanding
Recall	Discovery
One size fits all	Tailored; option rich
Talent via weeding out	Talent cultivated and sought out
Repetition	Transfer and construction
Acquisition of facts	Facts + conceptual framework
Isolated facts	Organized conceptual schemas
Transmission	Construction
Teacher = master and commander	Teacher = expert and mentor
Fixed roles	Mobile roles
Fixed classrooms	Mobile, convertible classrooms
Single location	Plurality of locations and space types
Summative assessment	Summative and formative assessment

it includes social components such as debate or direct engagement with peers and experts. Learning is strengthened through social interactions, interpersonal relations, and communication with others.

Net Generation students are achievement and goal oriented. Their question is not “What does it mean?” or “How does it work?” (as previous generations were inclined to ask), but rather “How do I build it?” This predilection maps to learning theory’s emphasis on active learning. Discovery, exploration, experimentation, criticism, analysis—all represent active learning, a style that suits the Net Gen well.

A pedagogy that emphasizes active learning has additional “targets of opportunity” among the Net Gen characteristics. Net Gen students are experiential, tending toward learning by doing rather than listening. Research indicates that learners need to be active with respect to their own learning process and assessment. Net Gen students’ goal and achievement orientation comes into play here: that achievement focus can be directed toward quizzes and exercises that assist learners in evaluating their progress toward learning goals.

Obviously not all forms of learning must be social or team-based. In a variety of learning contexts, individual work is important. It may well be that Net Gen students' strengths are also their weaknesses. The expectation for fast-paced, rapidly shifting interaction coupled with a relatively short attention span may be counterproductive in many learning contexts. Repetition and steady, patient practice—key to some forms of mastery—may prove difficult for Net Gen students. Designing courses for them necessitates balancing these strengths and weaknesses.

## Learning Space Implications

There are a number of implications of learning theory and the Net Generation for learning spaces. The convergence of the learning paradigm, IT, and the Net Gen is occurring now at colleges and universities. Current and future planning must encompass and encourage this convergence by thinking of learning spaces (classroom, informal, virtual) as a single, integrated environment. We should not neglect the informal for the formal, or assume that Net Gen students somehow will figure out the virtual space on their own. We should connect what happens in the classroom with what happens in informal and virtual spaces.

This implies that institutions may need to rethink their vision for learning and the spaces in which it occurs. Creating a vision for learning and learning spaces is a powerful leverage point; it informs almost all other decisions about learning space design. A vision also allows us to effectively articulate to all constituents what we are trying to accomplish. The vision helps organize all participants in the design and implementation of these spaces as well as the activities they support. Simply installing wireless access points and fresh carpeting isn't enough if done in isolation; such improvements pay real dividends only if they are in concert with the institution's overall teaching and learning objectives. It is the vision that generates the design principles that will, in turn, be used to make key decisions about how learning spaces are configured.

One important implication is that the vocabulary we use to describe what learners do in these spaces must become active. We must go beyond describing ways to help the instructor to be active; we must include students as well. The vision and design principles should emphasize the options students have as active participants in the learning process. Design principles should include terms such as *analyze*, *create*, *criticize*, *debate*, *present*, and *classify*—all directed at what the space enables the students to do. For example, students should be able to pres-

ent materials to the class. Outside class, they should have access to applications and materials that directly support analysis of data, text, and other media. Forums for discussion and critical debate, both real and virtual, are key to encouraging learning and will be looked for by Net Gen students.

Learning spaces should accommodate the use of as many kinds of materials as possible and enable the display of and access to those materials by all participants. Learning space needs to provide the participants—instructors and students alike—with interactive tools that enable exploration, probing, and examination. This might include a robust set of applications installed on the computer that controls the room's displays, as well as a set of communication tools. Since the process of examination and debate leads to discovery and the construction of new knowledge, it could be important to equip spaces with devices that can capture classroom discussion and debate, which can be distributed to all participants for future reference and study.

Learning does not stop once the instructor has left the classroom. Instead, the end of the class meeting marks a transition from one learning mode to another. As a result, institutions must address real and virtual spaces outside the classroom to ensure that they, too, encourage learning. For example, there should be access to class materials (which are increasingly digital) so that the active and social work of learning can continue outside the formal classroom. The design of “neutral” spaces, such as hallways and corridors, could be rethought and re-equipped to promote learning. Some institutions provide small discussion spaces in corridors so that discussion begun in class can continue when class ends. As for the virtual space, institutions should consider well-integrated work environments that support collaborative projects and resource sharing.

Informal learning spaces—those outside the classrooms—present particularly intriguing opportunities for pioneering and cultivating new teaching and learning practices. These spaces, while informal, are key areas for student academic work. Students spend far more time in these spaces than they do in formal classrooms. Research, Web browsing, writing, statistical analysis, and compiling lab reports all take place in the library, study hall, media center, dorm room, and learning commons. Because of their enthusiasm for IT and their experiential, hands-on approach to learning tasks, Net Gen students will easily “tune into” the virtual aspects of informal spaces. Well-designed and integrated physical layouts and IT “tool sets” will find a ready audience with Net Gen students.

## Scenarios

If we could implement this new vision of how learning occurs by buying the right kind of chair, purchasing projectors with sufficient lumens, or installing digital whiteboards, learning space design would be simple. Obviously it is much more complex—the task of designing and implementing learning environments that encourage good learning practice and accommodate the Net Gen learning style is a challenging one.

A starting point is to try to imagine what these new spaces might look like and how students would function in them. Creating scenarios helps define functions, usage practices, and design goals. Consider the following three scenarios as examples.

### Scenario 1: The New Lecture Hall

Sandra, a junior, is heading to her psychology class, which meets at 10:00 a.m. It's a relatively large class for her liberal arts college, with some 150 students, so it meets in a lecture hall. As she arrives, she sees that the professor has, as usual, both projection screens lowered, one showing course material, the other displaying the familiar “voting” screen. Sandra finds a seat among some friends and begins “moving in” to her space. This lecture hall is of relatively recent vintage; its seats and paired tables make it much easier to deploy and use her “tools,” which include printouts of the day's reading, as well as a small laptop computer. Her fel-

**Figure 1.** Technology-Supported Lecture Hall



Photo: Joe Mehling, Dartmouth College

low students are doing likewise. Each of them is using some device to access the course's Web site—some with laptops, others with tablet computers, still others with handheld computers. Using wireless connections, they all access the course's Web site and navigate to the site's "voting" page.

The professor commences her lecture. In one of the older lecture halls, she might have been tied to the lectern so that she could click through her PowerPoint slides. Or she might have abandoned her slides in order to write on the blackboard while her students scribbled notes in their notebooks. But in this newly renovated lecture hall, she and her students have many more options. She has what the campus technology office calls a "magic wand," a radio-frequency controller that enables her to operate her computer—as well as many of the classroom's functions—wirelessly, from any point in the room. She can capture anything she writes on the blackboard and make it available to her students on the course Web site. Freed from needing to take extensive notes, the students are able to participate more fully in the class discussion. Finally, the professor is carrying a small recorder that captures her lecture, digitizes the audio, and uploads it to the course Web site for the students to review when they prepare for finals.

Today she begins class by circulating through the room, using aisles that create paths through the students' seats. As she roams, she calls on students to share reactions to the readings. She encourages other students to offer additional comments. Soon there is some debate about the reading, which is facilitated by

**Figure 2.** PDA/Handheld Computer



Photo: Joe Mehling, Dartmouth College

the room's rows of paired tables and swivel chairs, making it possible to maintain eye contact with nearly everyone in the room.

At one point in the discussion, Sandra sketches a diagram on her laptop that she feels helps explain the concepts being discussed. She asks the professor if she could show it to the class. The professor agrees, and Sandra launches the classroom's screen sharing application. Within a few seconds, her computer's screen is projected on the room's main screen. The class discussion focuses on this diagram, and the professor, using a virtual pencil, is able to make notes on the diagram. The diagram and notes are captured and placed on the class Web site for review.

Soon the debate gets stuck; the students can't resolve the issue. The professor goes to the podium, types briefly, and then asks the students to go to a URL to see a question and to choose the answer they feel is correct. The students access the Web page from laptops, handhelds, or wireless IP-based phones. In two minutes they have completed the poll and submitted their responses. The results are quickly tabulated and displayed. The wide diversity of opinion surprises everyone. The professor reframes the issue, without giving the answer, and the students continue to discuss it. She repeats the poll; this time there is more agreement among the students, enabling her to move the discussion forward.

Halfway through the class period, the professor pauses the conversation. She goes to the podium computer and clicks on a few links, and soon a video-

**Figure 3.** Handheld Computers in Class



Photo: Joe Mehling, Dartmouth College

conferencing session is displayed on the right-hand screen. She has arranged to have a colleague of hers “drop in” on the class to discuss a point that is in the colleague’s particular area of expertise. The class has a conversation with the expert, who is at large research institution more than 500 miles away. Students listen to the expert’s comments and are able to pose questions using one of the three cordless microphones available to the class. On the left-hand screen, the visiting professor shows some images and charts that help explain the concepts under discussion.

The professor concludes the day’s class by showing a lab sign-up form, available on the course’s Web site. Sandra is able to access the Web page almost instantly with her handheld computer and succeeds in signing up for lab times that work well with her schedule. It was good she didn’t wait, for within 10 minutes of the end of class, the other students in her class have signed up for most of the slots, conferring with friends using chat programs to ensure that they sign up for the same lab slots.

## Scenario 2: Using the Virtual Learning Space

When the class concludes, Sandra turns to her neighbor to ask about several points the professor made in class. This attracts two other students, who enter the conversation. As the discussion continues, they are joined by the professor, who is heading out. Since another class is beginning to file in, the professor suggests they move outside the room to continue the discussion. They find one of the “discussion pockets” unoccupied and move in. The discussion pocket is the college’s term for a small, curved space with a table and bench to accommodate a meeting of four or five people. Found outside the newer classrooms, they are handy for informal, spontaneous discussions. Sandra’s group moves into the pocket and for the next 15 minutes continue their “spill over” discussion of the class.

After this informal discussion concludes, Sandra heads to the library; she has an hour until her next class and needs to get some work done. She finds some table space, pulls out her laptop, books, and iPod and sets to work. She checks on her e-mail and sends some responses. Three friends “drop in” on her via the chat program, and she spends a few more minutes conversing with all three on separate subjects. That done, she fires up her iPod to listen to some music she downloaded using her subscription to the official campus online music service.

Now she begins work on a term paper for a history class. She rummages through the library’s online collection, looking for a map she needs to illustrate a

#### Figure 4. Technology in the Library



Photo: Will Faller, Vassar College

point about 19th-century Asian history. She finds what she is looking for: although the map image is held by the library at a college on the other side of the country, Sandra has access to these resources. She is able to retrieve the map and insert into her document. She then traces arrows over the image to point out items important to the points she is making.

Again a friend drops in via chat, but this time it is about the joint presentation they are preparing for another class.

They are able to have an audio chat; Sandra's friend is in her dorm room, and Sandra is in a remote corner of the library where conversation will not disturb others. As their discussion progresses, they go to the course's Web site and launch the virtual whiteboard to diagram some concepts. They develop a conceptual diagram—drawing, erasing, and revising it until they agree the diagram is correct. They both download a copy. Sandra volunteers to work on polishing the diagram and will leave a copy of the final diagram in her share folder in her online portfolio “locker.”

Sandra returns to work on her term paper and decides a half hour later to take a break. She again checks e-mail, chats briefly with a friend about their upcoming soccer game, and switches playlists on her iPod. Then she remembers that she needs to review some Italian newscasts for her Italian class. The files containing

**Figure 5.** IP-Based Chat



Photo: Joe Mehling, Dartmouth College

**Figure 6.** Virtual Workspace Anywhere



Photo: Joe Mehling, Dartmouth College

the newscast video are on her iPod, so she plugs her iPod into her laptop, finds the video files, and launches her viewer application. Plugging her headphones into her computer, she is able to watch the entire segment, making notes on parts she did not fully understand. She then checks the class's Web site and sees there is an additional set of video files for reviewing. She downloads these quickly onto her iPod. Noting the time, Sandra packs up her gear and heads off to her next class, stopping once at a stand-up e-mail station to see the latest messages that have arrived in her inbox.

### Scenario 3: From the Information Commons to the Learning Commons

Had sophomore Martin come to the university at the same time as his older sister some six years earlier, he would have found, as she did, a computer lab. This was a large room, located in the basement of the science building, filled with benches and seats. At each seat was a computer. A set of documentation racks were on one side of the room; some documents were in short supply, while others were obsolete. On the other side was a help desk, staffed by students with a finite set of answers to the infinite variety of questions directed at them. Finding a free computer, particularly at the end of the term, was a challenge. Once you arrived at an available computer, there was little room for all your study materials: books, backpack, coat, and folders. The administration, anxious to maximize student access to computers, had crammed as many workstations as they could into the space.

While the computers worked fine for the most part (though cleaning them up after previous users was sometimes a chore), getting help was a problem. To get help—for the use of an application or for a research question—required going to the second floor for IT help or to the main floor of the library for research help. That meant leaving your computer unguarded, possibly to be claimed by another student equally hungry for computer time. So you ended up rarely going for help but instead muddled through as best you could, perhaps asking the student next to you when you were desperate.

But today Martin arrives at the first floor of the library and goes to a set of rooms collectively called the Learning Commons. At the threshold of the commons is the peer-tutoring room, a place where students can drop in and receive peer-based help with writing, research, or IT issues. Martin stops by to ask about incorporating MPEG-4 audio files into a PowerPoint presentation he's due to give next week for an anthropology course. At the same time, he is able to get some questions answered about relevant online journals for his research project in psychology.

Martin checks the time and heads to a work team pod—a small, horseshoe shaped table with a computer and large display—where he meets classmates from his chemistry course. The pod enables the work group to share the display and collectively work on materials. Martin works for an hour with three other students, reviewing drafts for their essays, checking online materials, and revising the Web site they are putting together for their collaborative project on the molecular properties of the surfaces of liquids.

Once that meeting is complete, he locates a free spot, pulls his laptop out of his backpack, and spends the half hour before his next team meeting doing a wide variety of things, including chatting with half a dozen friends about their party plans for the weekend. At the same time, he sends an e-mail to one of the TAs for the chemistry course, asking for clarification of an assignment. He also browses the Web, zeroing in on a Web site at another college that is relevant to his anthropology course work, as well as seeing if the latest CD from his favorite band is available through the Music Store. In a few minutes, he has purchased several tracks from it and downloaded them onto his computer.

Martin checks the time again. It's 10:00 p.m., and there's still a great deal to get done. He divides his time across several course assignments, numerous chat sessions, and reading (both from paper and from his computer screen). After a time, feeling drowsy, he goes to the Midnight Café, buys a soda and some chips, and returns to his work.

At 11:30 p.m., Martin packs his gear and heads to another part of the commons, the Media Studio, which offers a number of stations for students to use for more advanced work with video and audio. Martin is working with a team of four other students on an assignment for a film studies course. Their task is to find clips from a set of films that illustrate a particular filming technique and to explain why it is

**Figure 7.** Learning Commons



Photo: Roberto Marques, USITE/Crerar Computing Laboratory Seminar Area, University of Chicago

## Figure 8. Media Studio



Photo: Joe Mehling, Dartmouth College

effective. They rendezvous at a group station and spend the next hour reviewing films and identifying the clips they will use. They ask the student consultant on duty about whether it would be better to collect these in a single clip or as separate clips. By 12:45 a.m. Martin and his teammates have made their selections and given themselves tasks for the next phase of the assignment.

Martin calls up a Web page that contains a form for reserving one of the small group study rooms. He and some classmates have made an arrangement to meet with their anthropology professor. This meeting is to check on the progress Martin's group is making with their research project. The group wants the professor to review the video clips on their project Web site. Having found the reservation form, Martin is relieved to find that a room is available for the time they need; he reserves it. Noting it is now nearly one in the morning, Martin decides to turn in early for once (he has a language drill session at 7:45 a.m.). While walking back to his dorm, Martin prepares for the drill session by listening to some language lab audio files, which are streamed from the language lab server to his wireless iPod II.

## New Learning Spaces

These scenarios show Net Gen students and faculty engaged in learning practices that are leveraged by IT, a process that requires either improving current practices or creating new ones. The underlying theme remains the same, however: cultivating

learning practices consistent with learning theory and aligned with the habits and expectations of Net Gen students (and soon professors!) who have been “raised on” IT. The scenarios suggest the importance of integrating all learning spaces, formal and informal. For most higher education institutions, the lecture hall will not disappear; the challenge is to develop a new generation of lecture hall, one that enables Net Gen students and faculty to engage in enlivened, more interactive experiences. If the lecture hall is integrated with other spaces—physically as well as virtually—it will enable participants to sustain the momentum from the class session into other learning contexts. The goal is not to do away with the traditional classroom, but rather to reinvent and to integrate it with the other learning spaces, moving toward a single learning environment.

Building on these scenarios, Table 2 illustrates how Net Gen characteristics (such as the proclivity for group work) and learning theory might be supported by learning space design and IT. Learning theory is central to any consideration of learning spaces; colleges and universities cannot afford to invest in “fads” tailored to the Net Gen student that might not meet the needs of the next generation.

For example, start with the Net Gen students’ focus on goals and achievement. That achievement orientation ties to learning theory’s emphasis on metacognition, where learners assess their progress and make active decisions to achieve learning goals. Learning space design could support this by providing contact with people who can provide feedback: tutors, consultants, and faculty. This could, in turn, be supported in the IT environment by making formative self-tests available, as well as an online portfolio, which would afford students the opportunity to assess their overall academic progress.

Perhaps the most challenging aspect of these new learning spaces is the need for integration. As institutions create an anywhere, anytime IT infrastructure, opportunities arise to tear down silos and replace them with a more ubiquitous learning environment. Using laptops and other networked devices, students and faculty are increasingly able to carry their entire working environment with them. To capitalize on this, campus organizations must work collaboratively to create a more integrated work environment for the students and faculty, one that better serves the mobile Net Gen students as well as a faculty faced with the initial influx of these students into their ranks. This will involve not only libraries and IT organizations but also facilities planning and buildings and grounds departments. Development organizations may also become involved as institutions look for the resources needed to implement these new learning spaces.

**Table 2.** Aligning Net Gen Characteristics, Learning Principles, Learning Space, and IT Applications

Net Gen Trait	Learning Theory Principles	Learning Space Application	IT Application
Group activity	Collaborative, cooperative, supportive	Small group work spaces	IM chat; virtual whiteboards; screen sharing
Goal and achievement orientation	Metacognition; formative assessment	Access to tutors, consultants, and faculty in the learning space	Online formative quizzes; e-portfolios
Multitasking	Active	Table space for a variety of tools	Wireless
Experimental; trial and error	Multiple learning paths	Integrated lab facilities	Applications for analysis and research
Heavy reliance on network access	Multiple learning resources	IT highly integrated into all aspects of learning spaces	IT infrastructure that fully supports learning space functions
Pragmatic and inductive	Encourage discovery	Availability of labs, equipment, and access to primary resources	Availability of analysis and presentation applications
Ethnically diverse	Engagement of preconceptions	Accessible facilities	Accessible online resources
Visual	Environmental factors; importance of culture and group aspects of learners	Shared screens (either projector or LCD); availability of printing	Image databases; media editing programs
Interactive	Compelling and challenging material	Workgroup facilitation; access to experts	Variety of resources; no "one size fits all"

## Conclusion

This description of learning spaces is suggestive rather than prescriptive. Learning spaces are complex, containing a multitude of variables. One of the key variables is the institution itself. Learning spaces are institutional in scope—their implementation involves the institution’s culture, tradition, and mission. These institutional factors must be taken into account in order to design learning spaces to meet the needs of Net Gen students.

We must remind ourselves that today’s students are only the “first wave” to exhibit Net Gen characteristics. Soon they will be graduate students and assistant professors, bringing their Net Gen work habits to the faculty ranks. In addition, faculty who are baby boomers and Gen-Xers are acquiring Net Gen characteristics as they become more facile with—and dependent upon—IT. Planning for Net Gen requirements cannot be dismissed as catering to a single generation. IT and the work habits that IT encourages are here to stay; planning for the Net Generation is tantamount to planning for the future.

No single magic formula will guarantee successful learning spaces on every campus. It is clear, however, that it will not be enough if we simply place projectors, computers, and DVD players in the classrooms. Nor will it be adequate just to provide scores of publicly available computers. Such tactics, in isolation, may have little impact. Learning space design is a large-scale, long-term project, involving building and maintaining consensus, curricular vision, emerging technology, and layout and furniture options, as well as intracampus organizational collaboration. Learning space design requires a collaborative, integrated approach, with an overarching vision that informs and supports specific projects.

The starting point for rethinking learning spaces to support Net Gen students begins with an underlying vision for the learning activities these spaces should support. This vision should be informed by learning theory, as well as by recognition of the characteristics of the students and faculty who use these spaces. An institution’s specific culture, organizational structure, and fiscal circumstances enter the equation, as well. Once a vision has been established, the more concrete phases of planning can begin.

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## Endnotes

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