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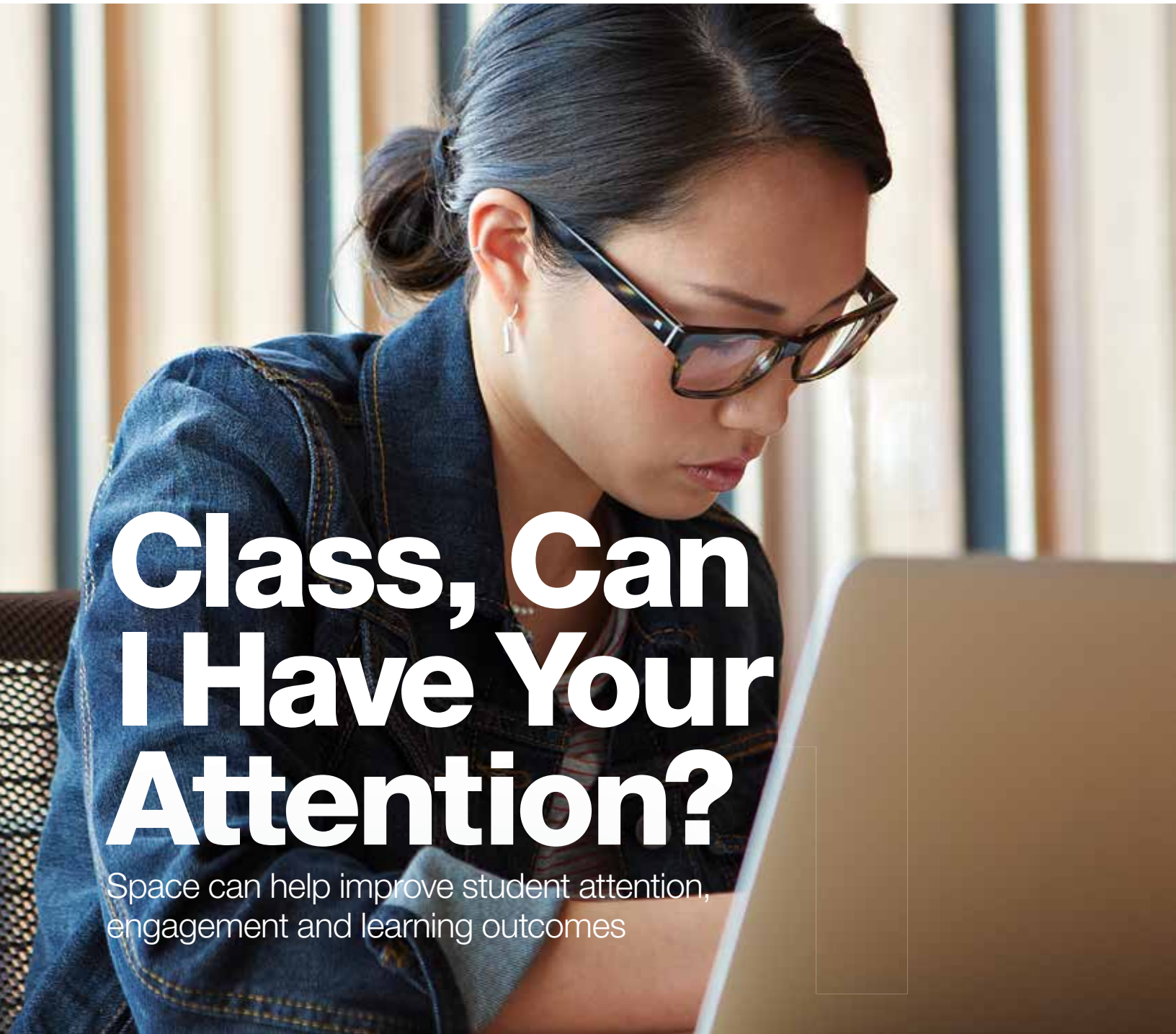

Class, Can I Have Your Attention?

Space can help improve student attention, engagement and learning outcomes

About this Issue

For years Steelcase has studied education with a unique, human-centered design research process. We observe educators at work and test design principles, product ideas and applications with the goal of improving student success, while immersing ourselves in the relevant research of others in such fields as learning research, cognitive neuroscience, environmental psychology, behavioral and social sciences and ergonomics.

This Education Edition is a compilation of 360 stories that explore these insights and demonstrate how new active learning environments improve student engagement and outcomes and help prepare them for success in the creative economy.

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The Education Edition

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Content

Class, Can I Have Your Attention?

Space can help improve student attention, engagement and learning outcomes.

Are colleges and universities adequately preparing students to be successful in the creative economy? This issue heated up again recently when a Gallup poll showed that only a third of executives believe colleges do a good job at graduating students with the skills businesses need. Another third say colleges don't do a good job at it, and one-third are neutral.

Educators counter with historical data that show the long-term financial advantages for college versus high school graduates. They also point out that colleges were never intended to be vocational schools and that companies need to take more responsibility for specific job training.

Part of the disconnect stems from the unique and daunting task that is education. Students are not uniform raw materials; they are human beings with diverse backgrounds, skills, hopes and dreams. Preparing students for the moving target of a creative economy, and jobs that often don't even exist yet, is no small feat.

The work is made harder because students don't seem to be engaged in the effort. According to Gallup research, just half of students in grades 5 through 12 are involved in and enthusiastic about school. Even sadder, student engagement scores decline steadily from the 5th grade well into high school, staying at their low point through grades 11 and 12.

"We believe, based on our own research, that engagement issues extend into the college years," says Andrew Kim, a Steelcase education researcher. "A big problem is that traditional learning experiences are not aligned with how the brain works, particularly as it relates to attention. This is a critical factor because engagement begins with attention."

Visit college classrooms and observe student behaviors, as Kim and his Steelcase WorkSpace Futures research colleagues do, and you'll see that students everywhere in the world are often more scattered than attentive. In class they converse with peers, check social media, send and read texts and sometimes pay more attention to digital devices than the coursework at hand. "There are more things vying for student attention today and that makes it harder to get the attention that leads to engagement," says Kim.

Building student attention begins with understanding the science behind it and applying those insights to the classroom.

Turn the page to see seven research-based insights about attention and learning that are, well, worth paying attention to.

Half of students in grades 5 through 12 are involved in and enthusiastic about school.

GALLUP

"A big problem is that traditional learning experiences are not aligned with how the brain works, particularly as it relates to attention."

ANDREW KIM
EDUCATION RESEARCHER, STEELCASE

1

Attention is a variable commodity

Average student attention spans are about 10 to 15 minutes long, right? That may be a frequently quoted statistic, but there's no empirical evidence to support it. Karen Wilson and James H. Korn researched the origins of the statistic in 2008, and say the 10–15 minute estimate is based primarily on personal observation and secondary sources.

Other research showed a pattern during class: a decline in student attention just 30 seconds into a lecture, reflecting a settling-in period.

- Declines also occurred at 4.5–5.5 minutes, 7–9 minutes, and 9–10 minutes into the lecture.
- Attention waxed and waned, with more frequent lapses as the lecture progressed. Toward the end, attention lapsed about every two minutes.

There's also recent research which shows that humans are capable of "sustained attention" for about 45 minutes to an hour, which may explain why various events run that length of time: TV and radio programs, class periods, church services, music CDs, even lunch breaks. However, despite what humans may be capable of, the speed at which a tedious lecture can lull a person to sleep demonstrates that sustained attention is a difficult thing to achieve.

Kim points out that attention varies based on the difficulty of the content and its relevance to the student, how conducive the environment is to paying attention, and each student's ability to sustain attention in class. What's encouraging to Kim is that "WorkSpace Futures researchers observed more success in maintaining student attention with active learning approaches that directly involve students in course content."

2

Active learning engenders attention

The WorkSpace Futures observations are bolstered by research by Diane M. Bunce, et. al. in 2010 ("How Long Can Students Pay Attention in Class?"), who compared a passive lecture approach and active learning methods. Researchers noted fewer attention lapses during times of active learning. They also found fewer lapses in attention during a lecture that immediately followed a demonstration or after a question was asked, compared to lectures that preceded active learning methods. This suggests active learning may have dual benefits: engaging student attention and refreshing attention immediately afterward.

3

Novelty and change get attention

As cognitive scientist Daniel Willingham points out in "Why Don't Students Like School?," change grabs attention. Something happening outside causes students to turn immediately to the windows. Similarly, when an instructor changes topics, starts a new activity or in some other way changes the learning process, "student attention returns, along with a new chance to engage them. So plan shifts and monitor your class's attention to see whether you need to make them more often or less frequently."

Our brains evolved to notice change as a way of staying vigilant for possible threats to individual survival. We naturally seek out what's new and different, and this curiosity is rewarded with dopamine and opioids in the brain that make us feel better. Thus, varying materials and breaks facilitate attention. A study by Kennesaw State University found that students paid more attention when the professor reviewed quiz answers, presented new information or shared videos, i.e., changed things up.

Novelty and change facilitate learning in another way, too. Repeating important points by engaging multiple senses helps to reinforce learning. That's because repetition strengthens connections between neurons. Our visual, semantic, sensory, motor and emotional neural networks all contain their own memory systems. "We have an amazing capacity for visual memory, and written or spoken information paired with visual information results in better recall," says psychologist Louis Cozolino. "There is a greater likelihood that learning will generalize outside the classroom if it is organized across sensory, physical, emotional and cognitive networks."

4

Physical movement fuels the brain

Research shows that aerobic exercise can increase the size of critical brain structures and improve cognition. Exercise pumps more oxygen through the brain, which stimulates capillary growth and frontal lobe plasticity. Exercise also stimulates the birth of new neurons in the hippocampus. Physical movement increases alertness and helps encode and trigger memory. Yet schools and teachers traditionally train students to be sedentary, and equate sitting still with greater attention and focus.

On the contrary, movement allows students to refocus and strengthen their ability to pay attention, as Lengel and Kuczala report in "The Kinesthetic Classroom: Teaching and Learning Through Movement." Simply allowing students to get out of their seats to move while learning provides the brain with much-needed novelty and change.

Schools are starting to incorporate more physical activity in the classroom, such as Delaney Connective, a high school in Sydney, Australia, where students do "brain pushups" each morning: five-minute, Tai Chi-like exercises that get the blood flowing and help students focus.

5

Seat location affects attention

The study by Kennesaw State University mentioned earlier also revealed that where students sit in the classroom impacts student focus. According to the study, students in the front and middle of the classroom stayed on task, while those in the back were more distracted. An active learning classroom where students easily moved and rearranged their seating enabled them to be more focused and stay attentive.

Classrooms configured with multiple "stages" (No fixed position where the instructor must stand), content displays and mobile seating offer even more flexibility. Here an instructor or student can address the class, lead a discussion and share content from anywhere in the classroom. There's no front or back of the classroom, and since the seating allows students to change posture and position easily, every seat is the best seat in the room.

6

Environment influences thinking

Learning can be enhanced or hampered by certain environmental conditions, notes Cozolino: "Inadequate school facilities, poor acoustics, outside noise, and inadequate classroom lighting all correlate with poorer academic performance." Even the chairs that students use can "hamper blood supply to the brain and impede cognition."

"Individual study requires deep focus. The harder the task, the more easily we're distracted, so the ability to screen out distractions is critical," says Kim. Students need spaces where they can avoid unwanted distractions and stimuli that interrupt focus.

However there are times when low-level environmental distractions are welcome. The flip side of focus thinking is diffuse thinking, which complements learning and creativity. In diffuse thinking the mind meanders. "Distractions of a certain intensity at this point can actually help the brain wander across different topics. This allows the brain to build new connections between disparate pieces of information, and new insights and understandings emerge," says Beatriz Arantes, a Steelcase senior design researcher and psychologist based in Paris, France.

Students need both the ability to screen out distractions or welcome them, depending whether they're writing a paper or seeking inspiration through sensory stimulation.

7

Learning has a natural rhythm

The need for periods of both quiet focus and healthy distraction finds its parallel in learning. The brain is often viewed as a thinking machine, moving in a linear fashion. But the brain and body are not machines; they are organisms with a natural rhythm of activity and rest cycles.

Research has shown there is a "rest-activity cycle" while sleeping, during which we move in and out of five stages of sleep. The body operates by the same rhythm during the day, moving from higher to lower levels of alertness. Our brain can focus on a task for only so long, after which it needs a break for renewal to achieve high performance on the next task. Ignore this rhythm and we get drowsy or hungry, lose focus, start to fidget. Stress hormones kick in, the prefrontal cortex begins to shut down and we are less able to think clearly or imaginatively.

Researchers have found that people who respect this natural rhythm are more productive. Breaks for rest and renewal are critical to the body and brain, as well as to attention span. The work of education is similarly organic, changing at different times of the semester, week, even during a single class period. Support for the rhythm of learning, says Arantes, "should be incorporated into instructors' pedagogies and course curricula, as well as through a variety of spaces for different rhythms: focus and interaction, individual and group work, socializing, and rest and rejuvenation."

Strategies for Nurturing Student Attention

Getting and holding attention requires an approach to learning spaces that takes into consideration both the brain and the body. Here are some sound strategies for nurturing attention, based on research at colleges and universities by the Steelcase WorkSpace Futures team:

Active learning pedagogies generate more student attention and engagement than traditional passive approaches. An active learning ecosystem equally supports and incorporates pedagogy, technology and space.

More choice and control fosters greater engagement. Flexible learning environments allow instructors and students to quickly adjust their learning spaces to the work at hand.

Movement is empowerment. Avoid fixed and unmovable student learning spaces.

Provide spaces that support both focus and diffuse thinking. Give students the ability to adjust their learning environment to the needs of the moment.

Assure optimal connection between students and class content. Design classrooms with multiple stages, content displays and mobile seating that allows students to focus their attention wherever needed.

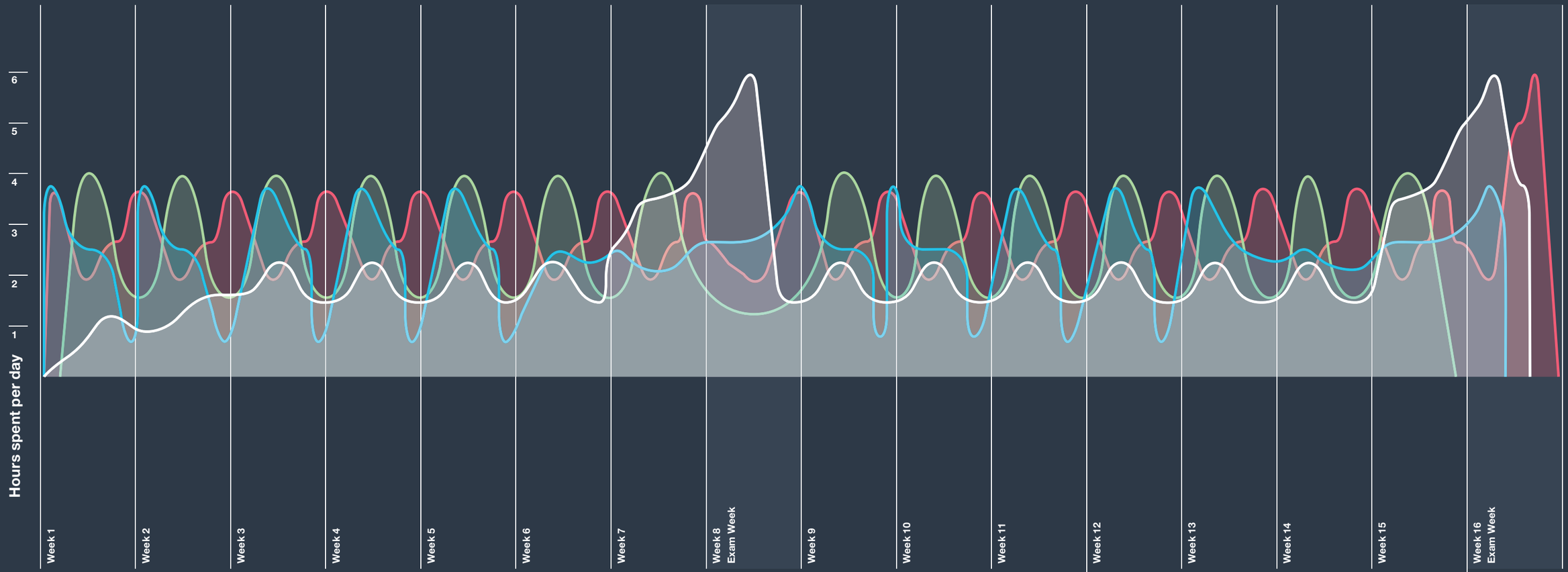
Support the rhythm of learning. Formal learning is just one part of the total experience; students' learning needs and behaviors fluctuate significantly beyond the classroom. A range of spaces that are flexible and offer choices assures they can select the best places to match varying needs for individual focus, informal collaboration and social learning.

Learning doesn't happen just in the classroom

Student learning incorporates a range of behaviors, including informal collaboration, socialization and individual focus, as well as formal learning in a classroom.

This rhythm of learning demands a range of spaces that are flexible and offer choice so students can select their best place for learning.

Typical semester



This graphic is a conceptual representation of student activities during a semester.

There is a significant difference in needs between an average week and exam weeks. This requires schools to provide a range of spaces that offer students choices so they can select the best place to learn.

- **Individual Focus**
- **Informal Collaboration**
- **Instructor Led**
- **Social**

A Typical School Week

During the semester students distribute their time between formal classes, individual focus, collaborating and socializing.

Exam Period

As the semester progresses and exams approach, students spend more time doing individual focused learning.

THOUGHTSTARTERS FOR:

Flipped Classroom

In this multi-modal classroom, students can spend most of their class time engaged in “homework”—active and personalized learning that complements the videotaped lectures they’ve watched outside of class.

Flexible furnishings support movement and a variety of classroom activities. Group sizes can morph from small to all-inclusive, depending on the type of learning taking place, and the instructor can move about freely within the space.

1 A corner setting with lounge seating provides an alternative space for working alone or with others, while also supporting the movement and posture changes that positively impact attention.

2 Views to nature trigger diffuse thinking, allowing the mind to wander and build new neural connections.

3 A wall-facing worksurface with high stools is a space for individual assignments that demand focused attention.

4 Content can be displayed throughout the room on portable whiteboards, adding to the flexibility of the space and increasing student access to content.

THOUGHTSTARTERS FOR:

media:scape LearnLab

The LearnLab™ integrates furniture, technology and worktools to support a variety of teaching and learning methods, with a unique X configuration and placement of screens triangulates sightlines, giving equal access to content. With no front or back of the room, all students can stay engaged.

The unique furniture configuration supports varied sightlines and activities throughout the class period, keeping content relevant and maintaining attention.

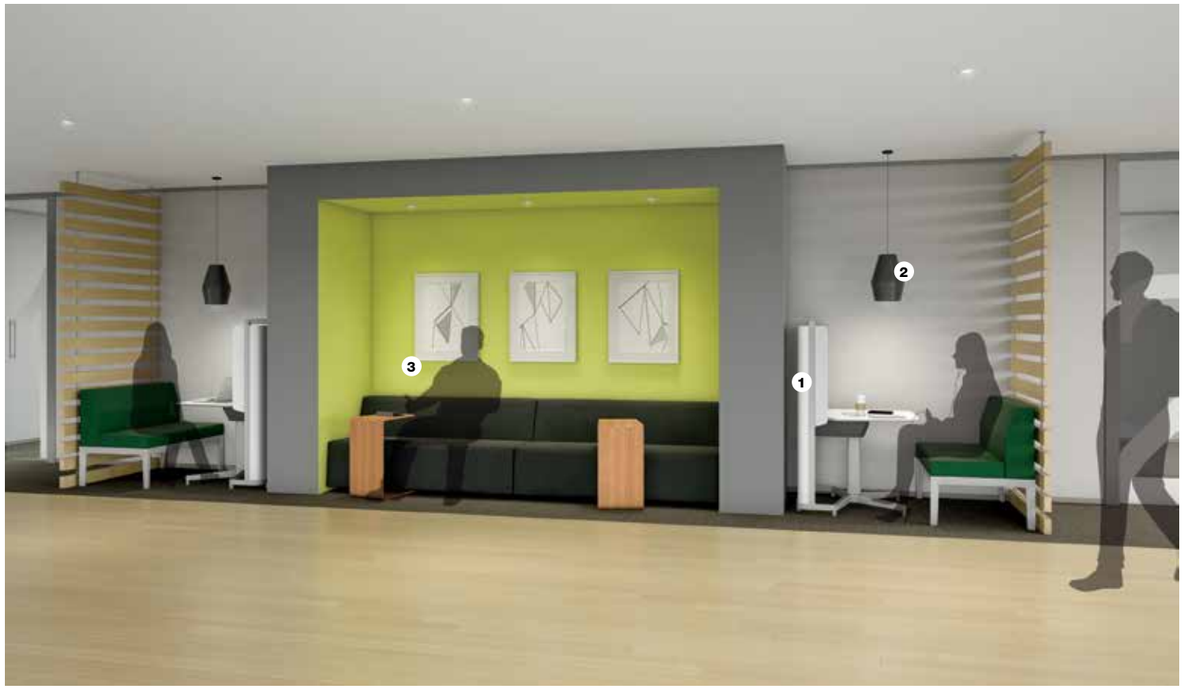
1 Face-to-face seating encourages engagement and team collaboration.

2 Fixed and portable whiteboards and display screens provide information persistence and allow students to generate, capture and share their work. Placement at the perimeter encourages students to move around the room, activating attention.

THOUGHTSTARTERS FOR:

In-between Spaces

Between classes, these are touchdown spots for finishing a reading assignment, reviewing content before an exam or meeting one-on-one with an instructor or peer. During class time, they can be a breakout area for group work or discussions.



1 The media:scape® kiosk provides a way for students and instructors to continue lessons or collaborate outside of class via videoconferencing.

2 Proper lighting reduces brain strain, helping students maintain attention and focus on their work.

3 This nook is a comfortable, sheltering environment for activities that require controlled focus and minimal distractions, such as reading, homework or discussions.

THOUGHTSTARTERS FOR:

Library

This transformed library is a macro-environment that supports collaborative, project-based work and social needs, as well as individual focused work. The adjacency of open spaces to more shielded settings allows students to manage distractions as needed.

1 Benching workstations allow students to work alone while staying near others, appealing to their sociability and allowing them to easily take breaks as needed.

2 Temporary storage for personal items means students can focus on their work without worrying about their things getting in the way.

3 Shielded microenvironments for individual work block outside distractions while also providing the body and technology support students' need for work that requires sustained focus.

4 Outside views provide for moments of mental rejuvenation and inspiration when students need to give their minds a rest.

Writing + Whiteboard: More Relevant Than Ever

It's the golden age for content display, with hi-def cameras and monitors, and touchscreen digital devices of every size. So why are traditional dry-erase whiteboards more popular than ever?

Besides being multitaskers—you can write or project on them, attach material with magnets—they also come in any size, don't need power and they're inexpensive. But what really makes whiteboards great learning tools is how they engage both the body and brain in the learning process.

Whiteboard work is both kinesthetic and visual. The act of writing and drawing engages the user physically and mentally, and that boosts learning. For example, research at Indiana University showed that neural activity in children was far more enhanced in kids who practiced writing by hand than in those who simply looked at letters.

University of Washington research demonstrated a special relationship between the hand and the brain when a person composes thoughts. Finger movements activate regions of the brain involved in thinking, language and working memory.

There are group benefits as well. Writing information and ideas on a whiteboard frees users from having to remember important information. Displaying information helps create shared group knowledge. Portable whiteboards make it easy for two or three users to jot down thoughts, draw correlations and build on each other's ideas.

"Educators know the research, and they see the benefits of whiteboards every day. It's not surprising we've seen growth with use of our products," says Shawn Collins, director of new business development for PolyVision, the market leader in CeramicSteel whiteboard material.

Collins says schools are continually coming up with new ways to use whiteboards. Installing whiteboards in the classroom at different heights to accommodate different users is increasingly popular. A university recently ordered five-foot high whiteboards so they can be used while sitting or standing. Whiteboards that slide horizontally are used to reveal content in sequence or cover up a flat screen when it's not in use. Personal-sized whiteboards work as privacy screens during test taking, presentation aids and as individual note taking tools.

With nothing to power up and no apps to open, a whiteboard is often the easiest, quickest way to seize a teachable moment, capture someone's attention and engage students of any age.

West Michigan Center for Arts and Technology
Grand Rapids, MI

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making way for making

The makers movement moves into education

The maker movement—a confederation of people with a passion for creating things who create communities to share equipment, space and ideas—has become a phenomenon throughout the world. Maker Faires, maker spaces and Make Magazine are visible signs of what some are calling a new "do-ocracy"—a renaissance of hands-on tinkering among groups of people who share resources and support each other's creativity.

Widespread and fast-growing, the maker movement invites speculation about why it's occurring and what its enduring impact may be. Most agree that advanced technologies such as 3D printers, still too expensive for most people to buy on their own, have spurred the movement. But there's also growing opinion that the maker mania may be a cultural reaction against a world that's become too virtual for comfort. "We need to find our way in a tactile world again. We need to return from head to foot, from brain to fingertip, from iCloud to earth," as Richard Kearney, a philosophy professor at Boston College, recently stated in The New York Times.

Whatever the drivers, as its influence expands, the maker movement is making inroads into education, especially high schools and universities, where it's informing new perspectives as well as reinforcing already-trending tenets of active learning.

"The maker movement focuses on collaboration as well as the physical act of making," explains Andrew Kim, a Steelcase education researcher. "In our research, we have found that, at the same time that technology is reshaping education, the importance of face-to-face learning is also growing, providing new opportunities for hands-on learning instead of all lecture-based."

Maker spaces in schools are far from traditional "sage on the stage" classrooms. Less predictably, they're also different than the industrial arts workshops of the past. The machines used to make things are now more sophisticated, of course, but so is the intent behind the curriculum, according to Scott Witthoft and Scott Doorley, co-authors of the book "Make Space" and the designers behind the learning spaces at the Hasso Plattner Institute of Design at Stanford University, more widely known as the Stanford d.school. Doorley puts it this way: "Industrial arts used to be taught almost like a trade school, whereas the maker movement is more about empowerment and getting students to see that they can affect change in the world."

Within education, maker spaces are emerging within or alongside innovation labs — settings where people engage in collaborative experimentation and problem-solving across a range of disciplines, increasingly using design-thinking methodologies. Whatever is being practiced, it's an active and collaborative way of thinking and approaching challenges. Although design thinking has its origins in design and engineering, it's not limited to those fields and the outcome isn't necessarily a physical object — what Doorley calls "stuff." Whether people are creating objects, systems or ideas, the maker movement dovetails into pedagogies focused on moving education from primarily a didactic delivery-of-facts mode to a more active, generative mode: "Learning to do as you do to learn," as Doorley describes the process.

The vision of empowerment through making is foundational for an after-school program at West Michigan Center for Arts and Technology in urban Grand Rapids. In the facility's arts and tech labs, teens selected from the city's public high schools

At the West Michigan Center for Arts and Technology, high schoolers practice creative problem-solving in "maker space" labs designed for hands-on learning.

have opportunities to flex their creative muscle, working with professional tools and technology as they learn skills in a team environment with professional artists as instructors. The facility includes "maker space" labs for photography, video game design, ceramics, fashion, sculpture, comic + zine, street art, and audio and video production. All are designed for active learning, easily reconfigurable depending on the task. Each year participating students choose a social problem and then apply design-thinking skills to creatively address it by making something. For example, this year they're focusing on the problem of bullying. To address it, those in the photography team are exploring techniques to create portraits that capture the intrinsic beauty of each person.

"It's about the process as well as the product," says Kim Dabbs, executive director. "By reflecting on the creative process and learning skills, students realize that they can make positive change, for themselves and their community. They find their voice."

A Fresh Perspective

The University of Southern Mississippi is another institution that incorporated design thinking when creating its Think Center, an innovative teaching and learning center that offers spaces and services for faculty development and student engagement. Included is an active-learning classroom that any professor can reserve and a variety of drop-in informal settings, equipped with whiteboards, markers, sticky notes and other innovation tools, for students working in teams or alone.

"We encourage students and professors to experiment, look at options, and think critically and creatively about strategies to improve the learning experience — really approaching everything with a fresh eye," says Bonnie Cooper, Think Center coordinator, who was a trainer in the business arena for 15 years before moving into higher education in 2000. "The excitement is what we love to see when people are in this space. Sometimes a new environment can bring a fresh perspective to a class. Here there's energy. Learning can be fun, and we see that. And I think the more students feel that way, the more enriched they become as learners."

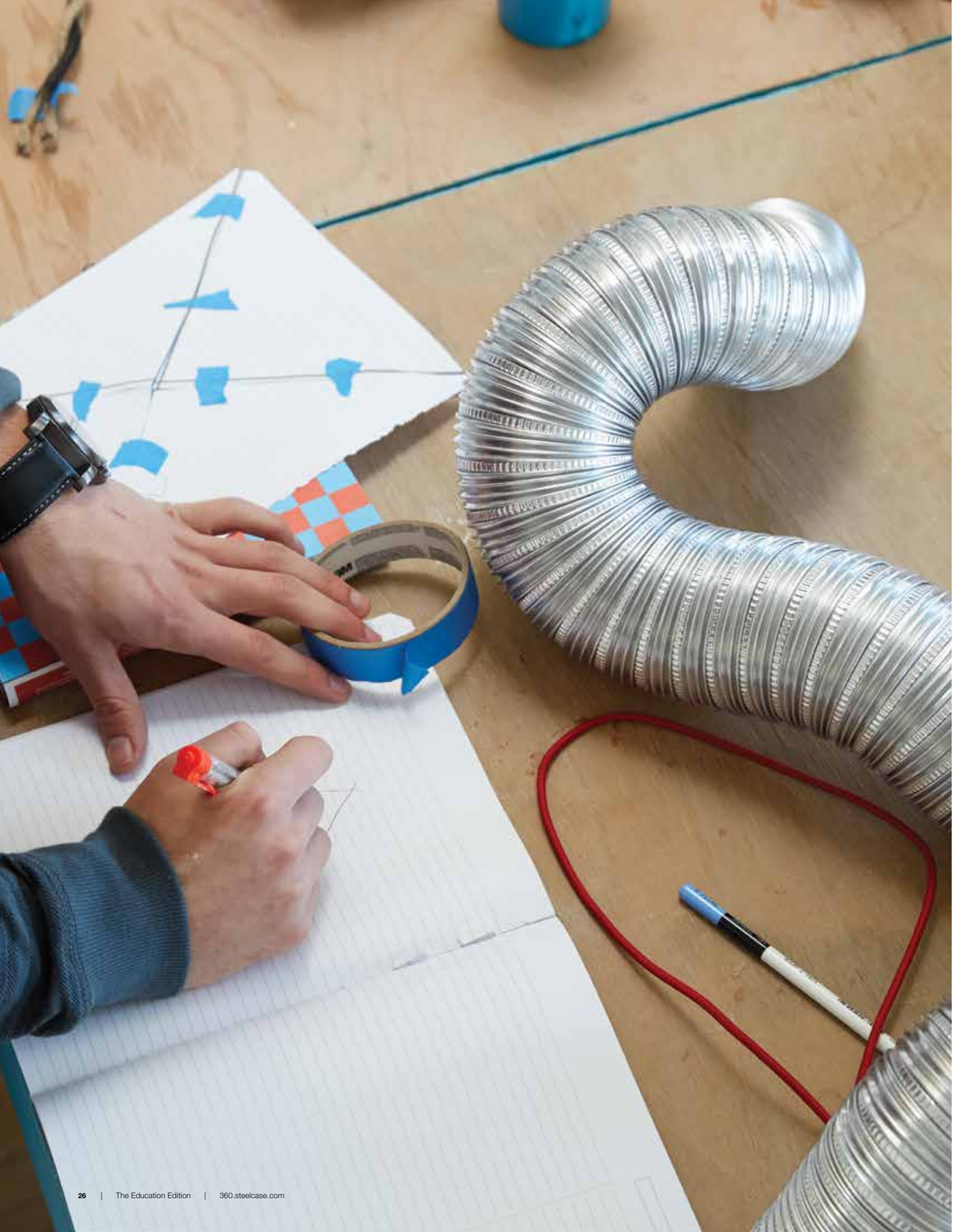
Within and outside of academia, many say it's an approach that is moving education in the right direction.

"We know that in today's job market there's increasing need for people with 21st-century skills, especially the ability to innovate, collaborate and respond to change in creative ways," says Steelcase's Andrew Kim. "It's a higher-order way of thinking that requires practice, not just theory. By teaching students to be collaborative and creative, schools are sharing the same goals as employers."

Thinking & Doing

New ways of learning require new kinds of spaces, and some of the most progressive universities are modeling their newest learning environments on corporate innovation spaces. Based on insights derived from more than a decade of research into educational environments, Steelcase provides products and spatial concepts specifically designed to support active learning. One prominent example: A small team of Steelcase researchers and designers collaborated with the d.school on aspects of the space they were creating. It has since become a widely emulated environment for project-based, creative learning.

"Creating spaces for active experimentation starts with intent," says Frank Graziano, a Steelcase researcher who has collaborated with the Stanford d.school and, most recently, the university's school of engineering. "How can space bias you to the action of thinking and doing? How can the space 'grant' a broader set of permissions, activating idea generation and supporting students by creating a means for translating abstract thinking into tangible artifacts?"



Teens selected from Grand Rapids public high schools have opportunities to flex their creative muscle at WMCAT, working with professional tools and technology as they learn skills in a team environment with professional artists as instructors.

Making a Maker Space

Based on research into creative learning spaces as well as the firsthand experience of creating and working in the company's own recently opened innovation center, Steelcase researchers and designers offer these guidelines for maker spaces:

Make it inspiring: Bright colors, comfortable furnishings, daylight and access to the outdoors stimulate engagement. Ambient stimuli can foster creative thinking. Dull surroundings stimulate boredom.

Make it flexible and make-your-own: Allow teachers and learners to configure the space to meet own their needs, recognizing these change from class session to class session and from one phase of the project to another. Mobile furniture is a must for configuring a variety of settings.

Create zones: Making and collaborating tend to be noisy, while contemplation thrives on quiet. Make sure the layout and furnishings are fluid enough to support students who want to work alone between collaboration sessions. Especially if it's a space that houses machines for making prototypes, separate thinking areas from making areas as much as possible.

Be ready for mess: Arraying materials helps teams "think out loud" about ideas and possibilities. Make sure that work surfaces are large enough for teams to gather around, and include adequate storage for materials and work-in-progress.

Leverage vertical displays: Working at a desk or table is private to those around it, but mobile and fixed whiteboards let everyone share ideas in the making and exhibit successes. When it comes to whiteboards and markers, there is no such thing as too many.

Support various postures: Physical postures and body movement can influence the creative process. In groups, standing can encourage interactions and engagement. For individual work, relaxed postures or walking can promote new ways of thinking.

Make digital content-sharing easy: More and more, relevant content exists in digital formats. Choose technologies that allow participants to easily share what's in their devices as well as what's in their minds.

"The maker movement isn't just about making for making's sake," summarizes Andrew Kim. "It's about understanding and practicing innovation. With that at its heart, it deserves the attention it's gaining in education."

flipping the classroom

A high school “flips” learning processes and spaces—and turns around student performance

There is no hope for your students.

High school principals are used to criticism, but for Greg Green, principal at Clintondale High School in suburban Detroit, Mich., that assessment by an educational consultant hit hard.

The school's problems were clear. Debt: $5 million. A majority of its 525 students considered at-risk. An outside evaluation that ranked Clintondale's technology infrastructure 542 out of 560. Student skill levels were all over the map. Failure rates, Green says, were "through the roof."

The consultants had no clear solution, and Clintondale could have easily become another tough-luck story of not enough money, a challenging student population and extenuating circumstances. Instead, the consultant's criticism marked a turning point for Green and Clintondale. "When they said that about our school, we drew the line right then."

Less than three years later, with minimal expenditure and creative approaches to learning and the places where it occurs, there's renewed hope at Clintondale. Student failure rates have plummeted. Grades and statewide test scores are up.

Upending the School

The turnaround started when Clintondale reversed the teaching and learning process, or "flipped" the school. In this model, teachers use laptops to record lectures on video and post them to the school's website, YouTube and other outlets. Students can watch the videos after school at home, in the school computer lab, on a smart phone—how and where it's most convenient for them. The next day in the classroom, building on the material they studied, students work on math problems, write essays, build science projects, etc. Teachers are at their side, coaching, answering questions.

If the approach seems counter to what schools and students have practiced for decades, Green says it's about time. "Look at the usual process in schools. Kids listen to lectures, then they go home. Where's the assistance at home? Sitting at their kitchen table, who's going to help them with advanced algebra, physics, chemistry? The parent hasn't been in the classroom in 30 years. They could be a physicist but they still don't know what the teacher wants the student to get out of the material."

The flipped model allows students to seek one-on-one help from their teacher when they have a question and learn in an environment conducive to education. "We have experts in the classroom, social workers, assistant principals, technology, all kinds of resources. So why keep sending the homework home where those resources are absent? Why not just reverse the process?"

I think you learn better with a better environment. I'm definitely more alert in this classroom.

—Isaiah

Rethinking the Classroom

Flipping a school causes teachers to rethink classroom procedures and pedagogies. Since lectures are on video, more class time involves collaborative work between students and teachers, students and peers. Clintondale worked with Steelcase Education professionals to explore how space can support a more active learning approach.

"Active learning is where students construct meaning by making their own discoveries. They don't just sit back and listen to a teacher lecture all the time," says Aileen Strickland, Steelcase design researcher. "They're more engaged in learning, frequently working in groups and interacting with peers. When students can move around, relationships are more dynamic, so furniture and space that supports a more active approach can help teachers and students adapt to these new methods."

Working with Steelcase, Clintondale transformed a classroom into a model for active learning. Out went old-style heavy metal student desks; in came lightweight Verb® tables with lockable casters and mobile Node® student chairs with flexible, swivel seats. Now students can easily shift between discussion, group work, working with another student or the teacher, test mode, or any other set-up. The room also includes a three-person lounge, ottomans, and individual and small group tables for brainstorming and sharing. There's also a stool-height table and chairs for team collaboration or individual work.

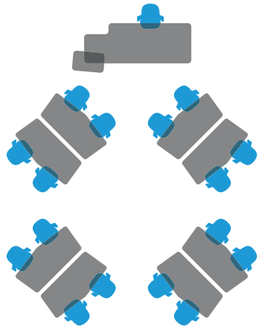
In moments the classroom can shift to the layout that works best for students, teachers, and the material at hand. "We've identified nine different ways to set up the furniture in the classroom so far, and there's probably more setups we'll create. Students simply rolls things around, reconfigure, and in two to three minutes they're back on task," says social studies teacher Michael Ward.

He believes the flipped model, a classroom built for active learning and the flexibility he has to adopt new pedagogies provide major advantages. "You can put 185 lectures on video, enough for the entire year, but that doesn't replace the teacher. What it does is let students watch the video when they want, rewind it as many times as they need and review particular points at their own pace. Once the students get that content, they come in here and we can teach to a higher level.

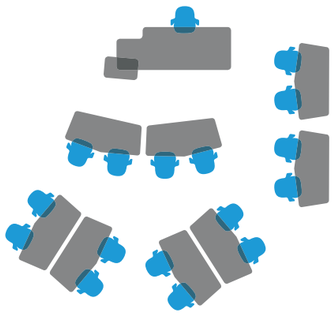
"We're embedding new skills in students, teaching them how to solve problems, to be more creative, to collaborate with others. This room has allowed us to teach to best practices and to explore new frontiers."

It takes time for a school to adopt active learning. "It's a gradual process, and it requires some training for both teachers and students," says Strickland. "It involves not only learning new pedagogies but also how space impacts learning, and how different pedagogies are best supported with different spaces and furniture."

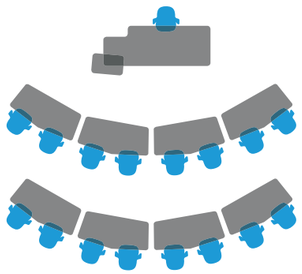
Blended spaces for learning



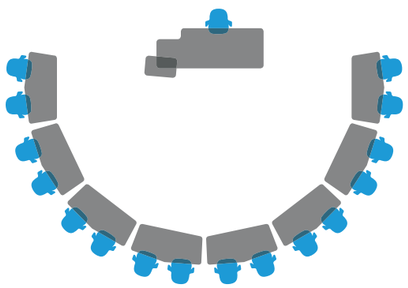
peer-to-peer + group



personalized learning



in-class lecture + review



discussion + presentation

Modest Investments, Major Returns

Even teachers at Clintondale without active learning furniture are using spaces differently. One instructor removed the teacher's desk from his classroom, saying he doesn't need it since he spends his time coaching and helping students one-on-one and in small groups. Another teacher uses a half-round table instead of a traditional hulking steel desk. He prefers the table because everyone can share material easier and he can work closer with students than from behind a desk.

Clintondale also rethought their 1950s vintage library, outfitting it with small tables, easy-to-move chairs and lounge seating. It's now a hub for class break-out sessions and group projects. Students also use the library for individual work, including watching videos on course material.

"Just introducing the new furniture made a difference. One student said, 'We've never gotten anything new before.' They got the message that the school is investing in them, so they should invest themselves in their education, too. It's a kind of a reciprocal agreement," says Ward.

Since the consultant's stinging assessment three years ago, Clintondale has experienced remarkable success. The ninth grade, the first to be flipped, saw the student failure rate drop by 33 percent in one year. Since September 2011, when the entire school began using the flipped model, the overall failure rate at the school has fallen to 11 percent. Student grades are up, as are statewide test scores.

Other schools have taken notice. Educators from around the world—over 300 at last count—have visited Clintondale to see what's going on. Reporters from national, regional and industry media outlets are constantly calling.

I'm improving my grades a lot. I can work better in this classroom.

—Brianna

For Principal Green, the greatest satisfaction is restoring hope for his students. "There was a national survey of nearly 500,000 students that showed that only one out of two students was hopeful. That's alarming!

"But educators can change this. We don't need to eliminate lectures, just offer them where students can review the material at their own pace. Classrooms can support active learning, with the experts and the resources and tools right there.

"Look at the results for our kids, who come from tough situations. We're creating more hope for them. Ninety percent are graduating. Eighty percent are going to college. Most of these kids are the first to graduate from high school in their family. This is how we can create hope, right here in our schools."

Failure rates dropped from 30–40% to 8–11%

Mastering the Mix: Technology, Space, and Learning.

Clintondale High School's flipped model shows how blended learning (part online, part in-classroom) can reshape the learning process. From online courses to videoconferencing and interactive whiteboards in classrooms, the possibilities are changing every level of education.

Steelcase Education researchers recently completed an in-depth design research study to better understand this trend and how educators might rethink how they can best leverage space and technology to improve the learning process. Their six research insights:

- → **Person-to-person connections remain essential for successful learning.**
- → **Technology is supporting richer face-to-face interactions and higher-level cognitive learning.**
- → **Integrating technology into classrooms mandates flexibility and activity-based space planning.**
- → **Spatial boundaries are loosening.**
- → **Spaces must be designed to capture and stream information.**
- → **High-tech and low-tech will coexist.**

The researchers conclude that classrooms and informal learning spaces must be highly flexible to support the new learning behaviors that are the direct result of new technologies.

Go Deeper

If you want to learn more about the interesting, insightful work being done by thought leaders referenced in our article, here is a menu of resources to choose from:

Clintondale High School site
flippedhighschool.com

Teacher Michael Ward's site
steelcase.com/ward

Research white paper: Technology-Empowered Learning: Six Spatial Insights
steelcase.com/technologyempoweredlearning

Video: How Verb Tables and Whiteboards Animate Active Learning
steelcase.com/verbanimation

THE NEW ACADEMIC HUB

GVSU Reinvents the Library for Learning

"We were trying to escape the gravity of the common library. We wanted this to be a very different place. We wanted it to feel different and look different, so that students could act differently."

Different indeed. As Lee Van Orsdel, GVSU dean of university libraries suggests, the new Mary Idema Pew Library & Information Commons at Grand Valley State University in Allendale, Mich. breaks free of the traditional college library in favor of a learning center for the 21st century. Forget the library as stuffy book warehouse, this is an inspired integration of space, furniture and tools for active learning, one that supports individual and collaborative learning, provides assistance and coaching for students in acquiring new skills, and allows unfettered access to content in every form.

How to make a college library relevant for the 21st century

Steelcase researchers and designers developed key design principles for libraries that play a leading role in higher education, principles that were integrated into the design of the new GVSU library:

- Design a range of library spaces that support social learning between students and peers, in pairs and groups
- Support the librarian's evolving, expanding role as content expert, IT service provider, collaborator and educator
- Optimize the performance of informal spaces through greater flexibility and user control
- Plan for adjacencies that recognize the range of activities that go on in the library
- Include spaces for individual comfort, concentration, and security
- Provide spaces that improve student awareness of, and access to, library resources

"We've elevated the concept of noise control to an art," says Dean Van Orsdel, noting the building's quieter east side compared to the west side that invites conversation in various collaborative workspaces.

"Up to 90% of learning happens outside the classroom, especially those skills students need to be successful after graduation: the ability to think clearly, to communicate, articulate and persuade, to work in groups and collaborate. This library is an academic hub where the learning that goes on after class reinforces what they learned in the classroom and helps students hone those essential skills," says Van Orsdel.

The transformation begins with a relatively modest number of books—150,000—in open stacks for browsing. Another 600,000 books are available via an automated storage system beneath the library; order a book online and it shows up in less than a minute. Need more? There's nearly a million volumes available digitally.

This strategy reduces the building's book footprint from 60,000 sq. ft. to 3,500 sq. ft. and frees up room for students, faculty and staff to work in ways that for a college library are different.

Here the learning spaces range from reflective, contemplative places, what Van Orsdel calls "almost cell-like spaces where a student can find refuge," to group spaces for active content sharing and creation. "We've elevated the concept of noise control to an art," she says, noting the building's quieter east side compared to the west side that invites conversation in various collaborative workspaces.

A sound system pipes programmed sound into collaboration zones so students feel comfortable speaking in normal tones of voice. On the east side, white noise helps mask sound and reduce distractions. The library also offers several outdoor spaces, including an amphitheater, an indoor café, outdoor patio, even a third floor reading garden.

“Up to 90% of learning happens outside the classroom”

Mary Idema Pew Library & Information Commons— by the numbers

153k
square feet

1,500
seats

19
group study rooms

10
media:scape collaboration settings

29
types of seating

150k
books in open stacks

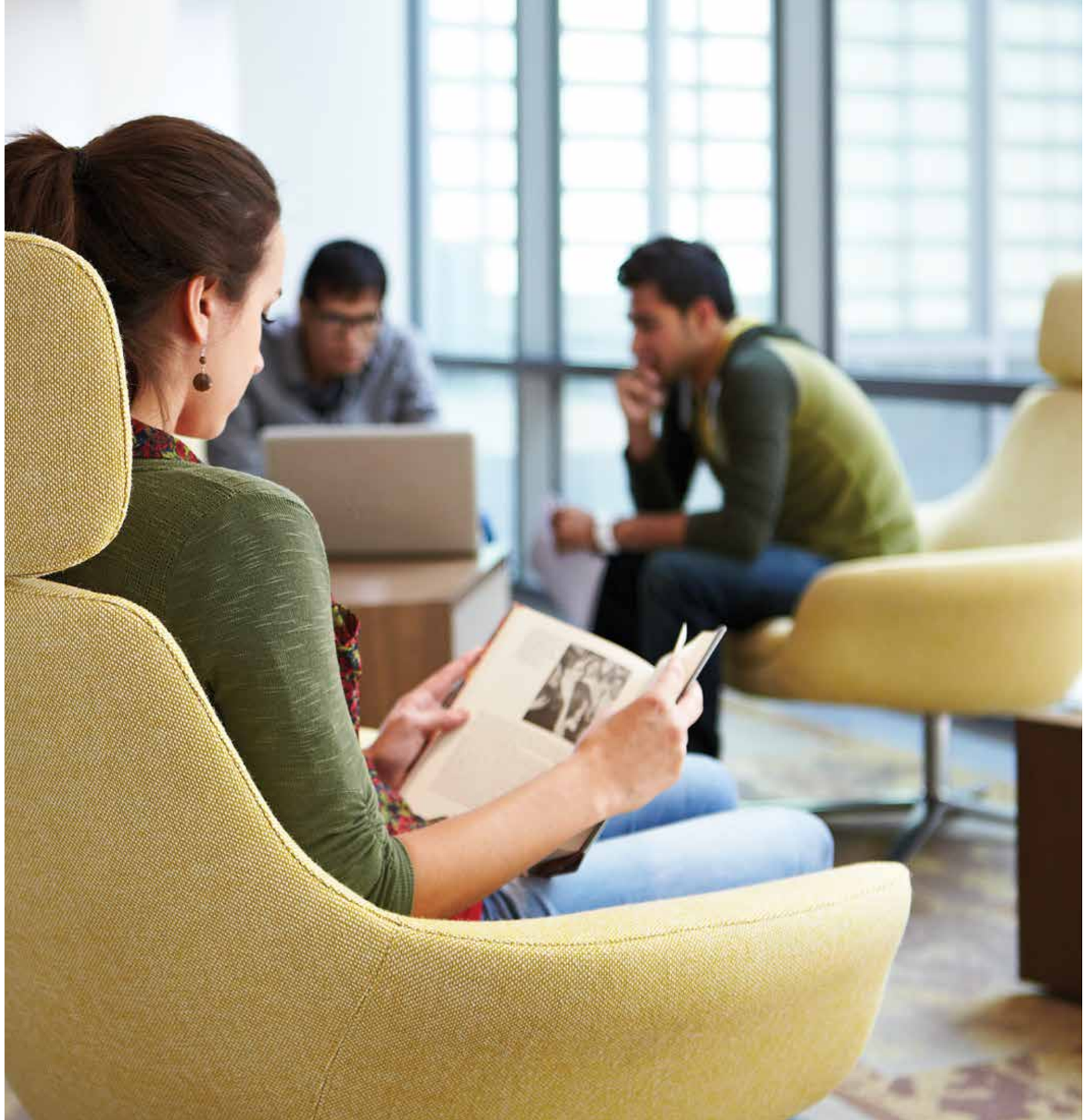
600k
books in automated storage and retrieval

1 million
books in digital format

250
computers

50%
less energy used (compared to other buildings of equal size)

$65
million total cost



Back in the heart of the learning process

Traditional college libraries designed around print-based resources became less relevant in recent years as access to digital content exploded. When GVSU began planning their new library five years ago, they wanted to rethink the library's role in learning and how the process of learning itself was changing. The university partnered with Steelcase and its WorkSpace Futures research group, along with SHW Group, an architecture and engineering firm specializing in educational environments, to conduct on-site research at GVSU.

"The college library can be a key location outside the classroom where active learning plays out. In the classroom, students are involved in hands-on learning but the instructor still leads. In the library, students take control of their instruction as they discover, analyze, and share information, and in the process become comfortable working individually and with others. It's a major shift from being a reading and storage site to a center for active learning," says Elise Valoe, senior design researcher with Steelcase, and part of a team that studied libraries at private and public colleges and universities across the country.

The researchers developed a comprehensive view of student learning patterns, including "a rhythm to students' life that was unknown to us," says Van Orsdel. Not unlike predictable semester patterns, with student activity increasing around mid-term exams and due dates for papers, "we found that there's a certain rhythm to each day, too. Students work pretty much alone during the daytime. But at night, groups come together, pull apart, reform and regroup constantly. They don't just go to a table or into a room, they consult all night long.

Forget the library as stuffy book warehouse, the Mary Idema Pew Library is an inspired integration of space, furniture and tools for active learning, one that supports individual and collaborative learning, provides assistance and coaching for students in acquiring new skills, and allows unfettered access to content in every form.

Student grades

GVSU students are giving the new Mary Idem Pew Library and Information Commons high marks.

Even student postures change during the day. While on task and hurrying between classes, they sit upright in a chair at a table. If they're waiting for a friend they kick back on a stool or in a lounge chair with a phone or tablet and relax. At night, they look for furniture that's mobile to accommodate team projects. The university also discovered that study groups—unlike most groups, tend to meet between 10AM and 3PM.

The vagaries of student study habits presented a design challenge: plan the space for the daytime when students work on their own, or for the evening when they work in groups? GVSU believes they found the ideal solution: spaces with furniture that's mobile, reconfigurable and in a variety of sizes and shapes, including 29 types of seating, plenty of whiteboards on both walls and wheels, and media:scape collaboration settings in various places around the library.

"Collaboration with digital content usually means six people in a room with laptops, swiveling screens around and a whole lot of straining to see the information. media:scape allows people to focus on the intellectual process of creating and learning together by not being bound by the physicality of everyone having a different device in front of them," says Van Orsdel.

She believes there's an added bonus to the library's inherent flexibility: "if we're wrong about this, we have so much flexibility that whatever students want to do, we can do it."

Another signature concept in the library is the knowledge market, an entryway place where trained students help classmates improve specific skills. "Universities typically do not make their services seamless. They're compartmentalized into pedagogical areas where they're taught: English, writing, research, technology, speech, etc. The knowledge market puts together in one place the resources to build all of the skills employers tell us are critical in the workplace: writing, speaking, presenting, research. Students manage their own learning, choosing the type of help they need, when they need it."

Open 6pm to midnight ("when we see the most collaborative behaviors"), the knowledge market is an open area in a can't-miss path by the main entrance. Kiosks, video monitors and displays encourage walk-ups, questions and quick collaborations.

Study Reveals Classroom Spaces Significantly Impact Student Engagement

New data from a Steelcase Education study has shown that student engagement is favorably impacted in classrooms intentionally designed for active learning.

The study, completed at four U.S. universities, assessed how different classroom designs affect student engagement, which is widely recognized as a reliable predictor of academic success.

"Improving educational outcomes is a nearly universal goal, but how to achieve it remains a focus of continuing research and debate. Although noteworthy studies have been completed in recent years, a variable that is still often underemphasized is the role of classroom design," notes Lennie Scott-Webber, Ph.D., Steelcase director of Education Environments. "We developed our study to address this important gap, create a reliable evaluation instrument, and contribute in a significant way to a growing body of knowledge about the relationship between the learning environment and student success."

Using the evaluation survey instrument developed by the Steelcase Education team, participants compared their experiences in a traditional classroom with row-by-column seating to their subsequent experiences in a classroom intentionally designed for active learning. The active learning classrooms were furnished with Steelcase products for active learning settings: Node® seating, Verb® classroom collection, LearnLab™ and media:scape® collaboration settings. Participants answered questions about engagement in learning activities occurring in the classrooms and then evaluated the impact of the classroom furnishings in support of these activities.

The majority of students rated the active learning classroom better than the traditional classroom on each of 12 factors identified in the evaluation, and there were no significant differences in the results from each university. In all, the active learning classrooms generated improvements in active learning practices for both students and faculty.

In total, the study has revealed that classrooms designed to support active learning result in improved student engagement across multiple measures. The study also revealed that students felt that the classroom design contributed to their ability to be creative, motivation to attend class, ability to achieve a higher grade and engagement in class.

"This study yielded major findings, all supporting the highly positive impact of the classroom on student engagement," says Scott-Weber. "There's now evidence that Steelcase Education classrooms encourage and enable educators to practice active learning methods, even without special training. As a result, decision makers at educational institutions, as well as architects and designers, can be more assured that investments in solutions intentionally designed to support active learning can create more effective classrooms and a higher predictability of student engagement."

Results from the first phase of the research, a beta study at three institutions, were published in the November 2013 issue of Planning for Higher Education, a peer-reviewed journal published by the Society for College and University Planning. The Steelcase team is continuing this managed research study with a number of universities throughout North America, building data and adding knowledge to this important field of study.

HOW TECHNOLOGY IS CHANGING EDUCATION

When a Stanford University professor offered a free online course in artificial intelligence in 2011, he had no idea that the experiment would attract 160,000 students from 190 countries and generate a wave of publicity.

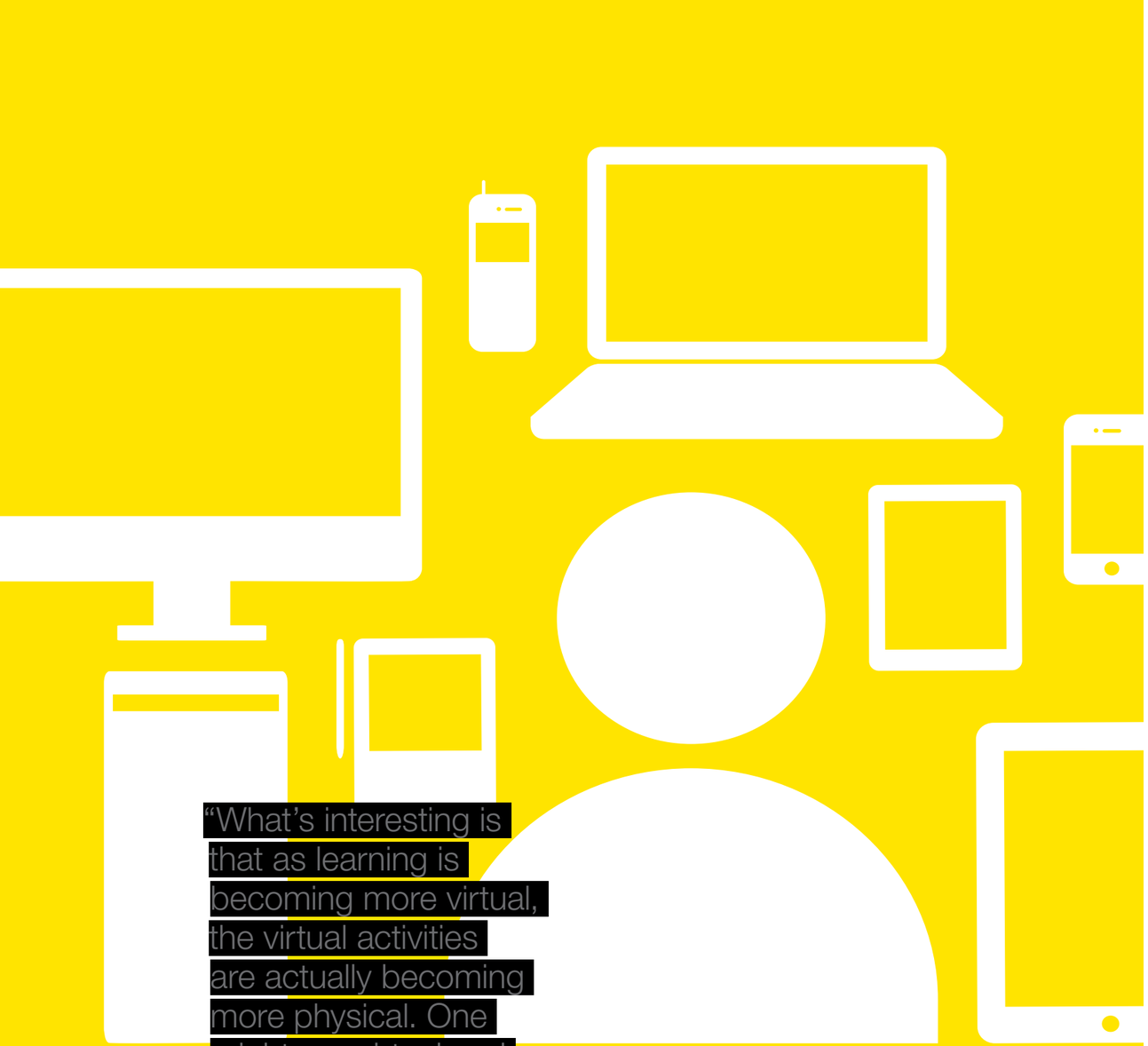
That's one of many examples of how technology is reshaping education around the world. From the rapid proliferation of massive open online courses, or MOOCs, to the widespread use of mobile devices that support a variety of "blended learning" models (part online, part bricks-and-mortar based), technology is creating new challenges and many new opportunities for educational institutions of all types, from early education to universities.

"As educators begin to rethink the learning experience, we believe it will be important to also reshape educational spaces to support this evolution," says Andrew Kim, a Steelcase WorkSpace Futures researcher and a member of the Steelcase Education team that has been investigating the spatial implications of learning and technology. So far, the study has involved observing and interviewing students and teachers at 20 schools.

Among the fastest-growing and irreversible trends at all levels of education: increasing use of laptops, tablets and other mobile devices. Many primary schools now provide every student with a laptop or tablet. At colleges and universities, many undergrads now own tablets as well as laptops. Always interested in the advantages of portability, a growing number are also now asking for content delivered to their smart phones.

As recently as a few years ago, mobile devices were used almost exclusively as only a souped-up substitute for conventional tools like handouts, transparencies for overhead projectors, books, paper and pens. Today, however, these technologies are beginning to transform how instruction and learning actually take place.

Teachers are using technology to replace old models of standardized, rote learning and creating more personalized, self-directed experiences for their students. There's more multi-device synchronization with software that supports multiuser collaboration and more support for virtual conversations, both within and beyond a classroom. And more students and teachers are creating their own digital content, including animations and videos.

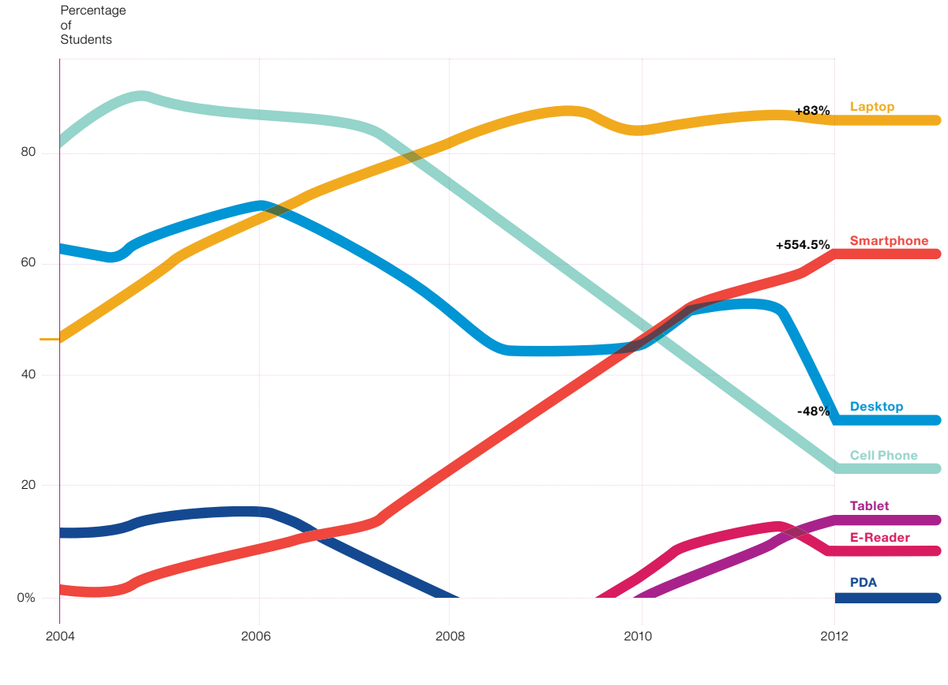


“What’s interesting is that as learning is becoming more virtual, the virtual activities are actually becoming more physical. One might say virtual and physical are meeting in the middle.”

Andrew Kim,
Steelcase WorkSpace Futures

Longitudinal Trends in Undergraduate Technology Ownership 2004 - 2012

Source:
Educause Center for Applied Research



Much of the information that only teachers possessed in the past is now available to students online, challenging the old model of teachers presenting content and students absorbing it. As a result, educators are now leveraging technology to create a different role for themselves in their classrooms. Instead of using class time to spoon-feed information, technology is helping them use their time with students to advance problem-solving, communication and collaboration—exactly the type of higher-order skills that leading education specialists say should be the goals of education for today’s world.

“More and more, classrooms are becoming places where knowledge is created versus consumed by students,” says Kim. “As students start to have more control over what they use to help them learn, you need to have spaces that support more creative or generative activities. This means more mobility inside and outside of classrooms, as well as new kinds of learning spaces that support varying individual activities and rates of learning. Providing a palette of place, posture and presence—i.e., virtual as well as face-to-face interactions—is as important in educational spaces as it is in workplaces, for many of the same reasons. In fact, schools are beginning to leapfrog corporations in the use of mobile devices and many are facing the related challenges head on.”

As the tsunami of technology trends washes over education, some things have managed to stay the same. For example, students and teachers haven’t abandoned analog materials—and aren’t expected to anytime soon. They continue to use whiteboards, paper and notebooks to capture and visualize thought processes, and will continue to need spaces designed to support the parallel use of analog and digital tools.

BLENDING WORLDS

Within all levels of education, learning is now occurring both remotely and onsite through blended learning programs that combine online and face-to-face interaction. Just one of many examples is the flipped classroom model in which students access content online outside the classroom as their homework and then apply this new knowledge in the classroom by engaging in active learning practices, such as discussion or group work.

Blended learning can cut costs, which makes it popular in today's challenging economy. There are also early signals from several studies that suggest giving students more control over how they access information can be more effective than all face-to-face or all virtual learning.

"What's interesting is that as learning is becoming more virtual, the virtual activities are actually becoming more physical. You might say the virtual and the physical are meeting in the middle," says Kim. "In many instances, you have different subjects happening all in one room, and multiple teachers acting as tutors and motivators to give directed support. It's shoulder-to-shoulder, even closer than face-to-face."

"The best places for education will bring people, technology and space together in innovative ways."

ONLINE LEARNING IS HERE TO STAY

Technology inclusion in lesson delivery is becoming the norm

160k

students enrolled in a massively open online course (MOOC) offered by Stanford in 2011. Source: Inside Higher Ed, 2012

20k

education and learning applications have been built for the iPad and 1.5 million iPads are currently in use in educational institutions and schools.

79%

secondary school teachers in France believe that in the past two years they have been using more technology in the classroom than ever before.

65%

of students in the U.S. have taken online classes.

Because blended learning changes the role of the educator to become more of a facilitator and coach, there's a growing use of para-educators who work alongside teachers to manage online learning and help with classroom activities. There are also spatial implications. Classrooms designed for a teacher at the front of the room may now need to concurrently support self-directed work at computers as well as collaborative projects. In the United States, for example, even some kindergarten classes now have a separate zone for individual online work within the classroom. Other schools are dramatically reducing the amount of space allotted for classrooms, instead creating large open areas for self-directed learning.

Colleges and universities, while embracing various forms of online learning, are also looking for ways to build student-teacher engagement and monitor performance. With MOOCs, in particular, approaches are still experimental. Despite online discussion forums, many students still seek face time with their professors and each other. The MOOC platforms are meeting this need by making it easier for students to meet through online social networking portals, grouped by geographical proximity.

Teachers have always been very aware that schools engender social learning as well as cognitive learning, and so the search for adding physicality to cyber schooling continues. For example, one MOOC professor announces "office hours" at a coffee shop in his destination city whenever he travels for students who want to meet in person. Some community colleges are now creating blended courses using MOOC content, with the MOOC providing the online experience and the community college picking up the offline experience of professors interacting in person with students.

Even as learning becomes more virtual, the importance of teachers and bricks-and-mortar places are expected to remain valuable components in the educational equation, says Kim. "As we continue our research, it's clear that the best places for education will bring people, technology and space together in innovative ways. If you think of classrooms as places where knowledge gets created instead of consumed, they have similarities to innovation studios where flexibility is built in and it's easy to switch between individual work and collaboration. More than ever, we're seeing the need for classrooms to become highly flexible spaces that support the new behaviors of learning that are the direct result of new technologies."

As rapid development occurs in previously underdeveloped nations and new technologies impact the way that knowledge is transferred and embodied, education is becoming even more valuable and valued throughout the world, and the quest continues to refine both its processes and the places where it occurs.

Teaching the Teachers

Israeli Teachers' College Embraces Active Learning

Dr. Shimon Amar, president of Ohalo College, a teachers' college in Katzrin, Israel, knows first hand about employer dissatisfaction with new graduates. Before he joined the college four years ago, Amar was director of organizational development at Intel, and he agrees that the traditional approach to teaching is not delivering results.

"Students are not coming ready to do the work that they are intended to do. The traditional teaching approach is too artificial. It's an environment that is not at all similar to what they will be in."

By introducing new active learning classrooms and teaching pedagogies at this teachers' college, Amar and his staff are preparing a new generation of instructors, and ultimately their students, for the 21st century. At the same time, these dynamic new learning spaces are attracting students to Ohalo, one of more than two dozen teacher training colleges in Israel.

The classroom, Amar says, must be dynamic, mobile and fast-changing, "a place where things can be changed immediately and be adapted to the learning and to the outcome of what you want from the learning."

We’re educating a new generation, helping students deal with the challenges of the modern world.

Dr. Aviva Dan, one of the first Ohalo faculty members to teach in the new classrooms, says it’s been a challenge to evolve from traditional teaching methods, but embraces the chance to influence young instructors. “We’re educating a new generation, helping our students deal with the challenges of the modern world, the demands of a highly dynamic society.”

One large classroom regularly hosts a class of more than 100 students led by three instructors. The room never stays in one layout for long; reconfiguring the furniture happens regularly. For most of the class time, students work in small teams or one-on-one, tackle projects and hold group discussions.

Smaller classrooms are flexible and mobile enough to accommodate both active learning pedagogies and more traditional lecture formats, not only to support more types of courses but also to allow other teachers not familiar with active learning to make a gradual transition to it.

Each classroom works on a stand-alone basis or in combination with other rooms. Classes often move from one small classroom where, for example, the focus is problem-based learning, to another room with a media:scape setting for small group collaborations.

In a large classroom, the transitions all happen inside the space and the flow is very organic. “You are not moving from one classroom to another. You stay in the space and decide when to move physically, intellectually, emotionally to another space, and it’s continuous. When it is continuous like that it means it’s evolving, and once it’s evolving you arrive to a higher level of competency,” says Amar.

Soon after the classrooms opened, Ohalo hosted a conference of educators from colleges and universities in the region. Amar fielded many questions and concerns about the new spaces. “We heard some criticisms of our learning spaces: ‘It’s not scalable. You can’t implement the technology. It’s not a real classroom.’

“But soon we had a lot of demand for visits to see them. Two or three months after that, we hear about other schools creating classrooms like ours. Now everyone wants to learn from us—what we did and how we did it. This is really going to change teaching.”

Creating A New Learning Experience

Ohalo worked with Steelcase to design and outfit a series of active learning classrooms to bring their vision to reality.

Large Classroom

Supports up to 120 students where three teachers work in the space simultaneously.

Medium Classroom

Supports up to 36 students and can be easily reconfigured to support different learning modes and teaching pedagogies.

Small Classroom

Supports up to 16 students and can easily be reconfigured to support different learning modes.

LearnLab™

Supports up to 28 students, and removes the barriers to sharing information by democratizing how people access information.

Thread™ power distribution

Ultra-thin, ultra-simple and ultra-fast, Thread provides power to the devices students use and the places they learn.

steelcase.com/thread

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EDUCATION