Flipped Classrooms Change Student Learning

By David A. Bateman, Jr.

Listen to the lecture at home, and do your homework in class. It may seem counter to what some of us grew up doing, but it has become commonplace on today's campus. Traditionally, students learn new information through lecture or direct instruction while in school. In a flipped class, students study the lecture at home and class time is spent discussing, experimenting and exploring those topics in greater depth. Since around 2000, the upside-down or flipped classroom model has seen more acceptance and adaptation, and gained more mainstream media attention. However, that is only part of the story.

Advancements in personal computing have pushed the envelope on not only what students learn, but how. The terms "active learning classroom" and "team-based learning" describe a pedagogy in which students are actively engaged in the learning process. Similar to the flipped model, these approaches involve students working together in class to advance what they learned at home. They are working in teams to solve a problem or developing a solution to an issue by collaborating with the teacher as well as their peers. With or without technology in the classroom, this model has shown to improve learning outcomes.

New Solutions

By adding technology to these models, so-called "TEAL" or "SCALE-UP" solutions have become prevalent in the classroom.

TEAL, developed at MIT in 2004 as Technology Enabled Active Learning (or Technology Enhanced Active Learning), involves a new classroom setup by removing the front lectern, placing the instructor in the middle of the class, and locating a video projector, flat screen displays and white boards around the room perimeter. Small groups of students work together and help each other through the curriculum. The technology connection provides immediate access to online resources. In addition, the instructor has the flexibility to refocus individual groups, while allowing others to continue working without interruption.

The SCALE-UP model known as Student-Centered Active Learning Environment with Upside-down Pedagogies, is another name for the same classroom layout, with an included description on the teaching style.

Now that we have defined these learning trends, let's examine the infrastructure required to support these technology-rich classrooms. How is technology connected and how do students use it? And what is needed behind the scenes to support it?

Unique Classroom Design

There is a great deal of similarity in how these classrooms are laid out. Typically, tables of six to eight students are spread around the room with a teacher station centrally located. Display devices are hung from the walls, usually one per table as space allows. With the cost of flat-panel displays continuing to drop, these seem to be more prevalent than video projectors and projection screens. This allows more whiteboard space when the display is not being used. When wall space is not sufficient to support as many flat screens as desired, some classrooms elect to have two displays back to back, floating the rooms with groups of students seated on either side.

With either the projection or flat screen display solution, the next factor is connection. Students need to be able to connect their device to the display to show work, as well as connect the device to the network. Current estimates indicate that by 2020, each student will have six wireless devices. That proliferation of personal technology requires the school's wireless infrastructure to provide sufficient coverage and bandwidth. Careful planning and predictive Wi-Fi mapping can help a campus ensure its TEAL classrooms have sufficient throughput to avoid that frantic call that the network is down.

Once the network bandwidth solution is addressed, connecting student devices to the displays in the classroom is the next critical element to the "technology enhanced" portion of learning. In order to answer the question "How do I connect my device to the display?" we need to understand how the instructor wants to collaborate with student devices.

Students can connect via a wired connection between their device's (laptop/tablet) video output and the input to the display. This requires that there is a connection plate either under the display or through a floor box under their table. In a SCALE-UP classroom with 12 tables, that can be a lot of floor boxes or poke-through devices, which almost certainly give the structural engineer some pause. That scenario also limits the ability to move tables into different configurations.

A wired connection also requires that a student device have a video output port. As we have seen recently, some portable devices require adapters and dongles in order to connect to an external display.

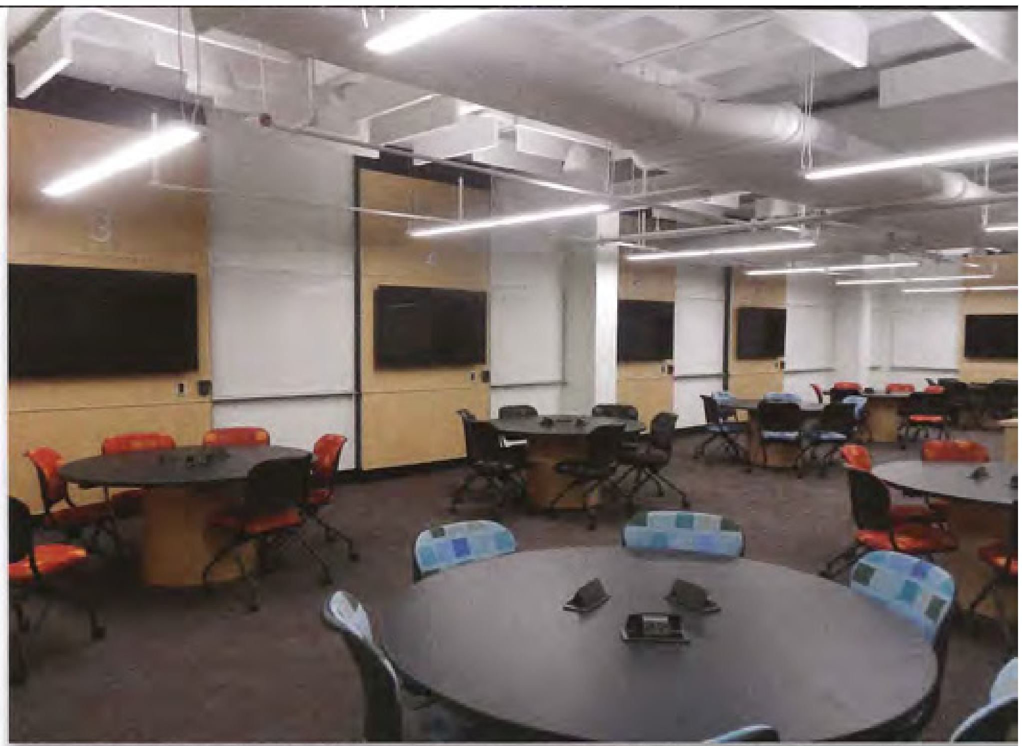
Also, many smartphones do not have any way to output video directly, and this is the one of the six devices a student may have on any given day.

The other connection option is to connect the device wirelessly. There are a number of solutions that allow students to connect to the AV system and show content, regardless of the device type. A number of wireless receiver solutions also allow multiple students to connect simultaneously, which is exactly what the TEAL classroom is designed for: Group learning with technology enhancements.

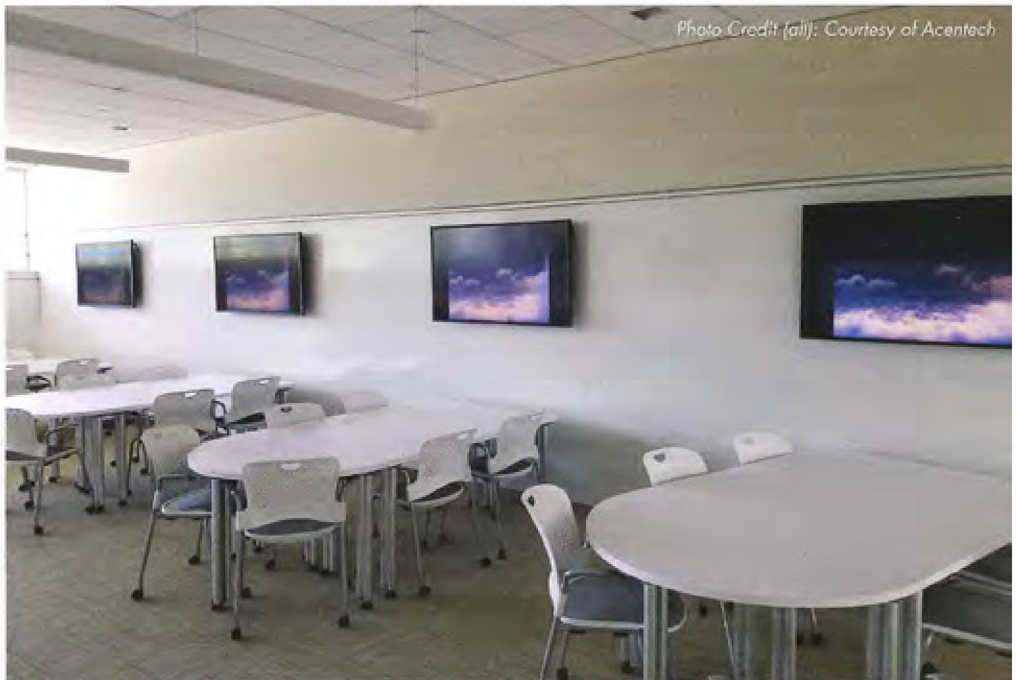
Case in point: A group of six students are working in class on a team project. One student finds a great piece of content on the web and wants to share it with the team. He connects his device wirelessly to the team's display. Three other team members also find data for the project, connecting their devices to the display so that all four pieces of content can be seen simultaneously. The ease of this technological collaboration becomes an incredibly powerful teaching tool. Not only are students learning the subject matter, but they are also learning how to research, strategize, and work as an integral part of a team.

Another important design factor is how interior finishes and background noise levels need to be carefully programmed to account for groups of students working simultaneously. Absorptive finishes to help mitigate noise might be necessary. In addition, wall construction between adjacent active learning classrooms will need to be addressed to limit sound transfer. Finally, HVAC noise within the classroom needs to be quiet enough to allow instructors to be heard by students.

When each of these factors is taken into account, students can collaborate, teachers can interact easily with student groups, technology can run smoothly, and learning can take on a whole new meaning.



The Bryant University Academic Innovation Center in Smithfield, R.I., features movable, six-student tables, positioned directly under their associated display.



Acentech specified wired and wireless connections to the flat panel displays that correspond to round tables at the University of Rhode Island Carothers Library Active Learning Classroom in Kingston, R.I.

David A. Bateman, Jr. is a principal at Boston-headquartered Acentech, a multi-disciplinary acoustics, audiovisual systems design and vibration-consulting firm.