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Root and STEM

STEM facility programming checklist: Uncovering new facility drivers from educational disruptors

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Wasting time, money and effort constructing facilities that incur maintenance costs indefinitely without measurable academic or revenue gains can be a nightmare for school leaders.

Too often, planning and programming processes lead to facility decisions that are based on assumptions that have not been substantiated by real success drivers or influenced by disruptors in traditional education. The initial planning process includes identifying a need usually generated by a dean or a specific department, identifying a funding source, and negotiating a building program.

Gathering information to develop a building program for STEM facilities such as teaching laboratories can be daunting. The tendency is to review existing spaces, hold meetings on what has or has not worked, develop a space list and identify the adjacencies, components and equipment within each space. This is a logical approach that takes lessons learned in the past to develop new programs for buildings.

But what's missing is analysis of what the drivers of these spaces are. Often, these solutions are answering the "what" of a question without considering the "why."

When developing a building project, don't start with a solution. Instead, find the small questions that build to larger, more comprehensive questions that build a framework of analysis. Start granularly and end globally. This leads to more effective and efficient design.

When an education institution is looking at building a new STEM facility, the first question should be, "Why a STEM Facility?"

The auditorium/lecture theater at the Guidewell Innovation Center in Lake Nona, outside of Orlando, Fla.
Photos courtesy of RS&H.

STEM degrees granted and STEM jobs and salaries are increasing, according to a 2016 STEM index compiled by U.S. News and Raytheon. STEM jobs have increased more than four times faster than overall employment since 2000, and computer jobs hold the top seven positions for the highest number of employees. In 2015, there was a 6 percent increase in STEM graduate degrees granted and a 5 percent increase in all STEM degrees granted.

These are compelling facts that drive educational institutions. Questions raised:

- Is the institution expanding existing STEM programs or starting a new one?
- If existing, what is the enrollment history and trajectory of the STEM program?
- What departments will be included?
- How are the departments structured?
- What is the interaction between disciplines?
- Are these programs limited to undergraduate studies or do they include graduate studies?

DISRUPTORS MAKING A DIFFERENCE

The educational landscape has changed immensely in the last five years. It is an environment that incorporates virtual reality and time itself. There are now basic disruptors in education that affect the physical environment of a campus, why institutions build buildings and what they program into facilities.

DISRUPTOR NO. 1: DISTANCE AND DIGITAL LEARNING

As overall distance enrollment has grown, on-campus enrollment has fallen by 5 percent since 2012, according to the Babson Distance Education Enrollment Report. The number of students physically attending private, for-profit campuses to study dropped by 31 percent. In addition to this:

- 6 million-plus students are enrolled in higher education distance courses.
- 30 percent of students in higher education are taking at least one distance course.
- 14 percent of students are enrolled exclusively in distance education courses.These facts bring to mind a series of questions that affect facilities:
- What is generating the increase in digital or distance learning?
- How do the limitations of capital funding affect digital learning?
- How does digital learning affect the revenue generated by an institution?
- What are the processes of digital learning that enhance – and inhibit – learning?
- What changes in student life, demographics and populations affect digital learning?
- What is the effect of digital learning on teaching methods, instructor preparation and student interaction?
- What is the effect of digital learning on space allocations

Exterior of the Hillsborough Community College Southshore Campus Science and Technology Building in Ruskin, Fla.
Photo courtesy of RS&H.

and facility infrastructure?

This disruptor generates a series of questions that affect the physical space allocations and types of spaces required to enhance learning.

DISRUPTOR NO. 2: WORKING STUDENTS

The cost for a college education is driving more students to work while enrolled. Three out of five college students receive no financial aid from their parents. About 2 million people older than 60 are still paying off student debt.

With this in mind, 80 percent of all undergraduate students work while attending college.The percentage is similar whether students attend public two-year, public four-year, or private four-year institutions.

Not only are more students working, but they also are working more hours. The number of traditional-age undergraduates working fewer than 20 hours per week has decreased, and the number working between 20 and 34 hours per week has increased. This creates additional stress and anxiety that results in fewer students completing their degrees.

Some questions to ask based on these facts:

- If the numbers of working students are increasing and the incidence of stress-induced degree abandonment is increasing, what responsibility do universities have to assist in the success of their working students?
- How does the increase in working students affect the flexibility required for the times instructional coursework is offered?
- How does it affect when materials and hands-on labs are available?
- How does it affect access to instructors and other students, or testing of student performance evaluations and procedures?
- How does this alter the viability of decentralized locations for facilities – bringing the facilities closer to the students?
- How does this affect job placement for students?
- Is there a way for the institution to partner with private business to enhance the learning experience while earning money?
- Does this affect how many students choose to live on campus?

DISRUPTOR NO. 3: TEACHING METHODOLOGY

One of the nation's top educators advancing the methodology of teaching is Sanjoy Mahajan. His lectures at the Massachusetts Institute of Technology on "Teaching College Level Science & Engineering" should be a primer for programmers of STEM facilities.

Mahajan's work is rooted in two statements: "Teaching is not equal to Learning" and "Knowledge is not the same as Understanding."

Interior of the Hillsborough Community College Southshore Campus Science and Technology Building in Ruskin, Fla.
Photo courtesy of RS&H.

The whole idea that meaning and knowledge are constructed by the learner provides a perspective that can help guide the programmer of STEM facilities. Mahajan's methods include ways to promote questions and discussions to stimulate the left brain, and use of stories, humor, demos and visuals to stimulate the right brain.

These concepts are aligned with the four modes of engagement behaviors outlined by Michelene T.H. Chi and Ruth Wylie in 2014 at Arizona State University. The Interactive, Constructive, Active and Passive (ICAP) framework triggers higher levels of learning from passive to interactive.

Programmers crafting spaces need to incorporate the adaptability required for multiple levels of interaction. This doesn't just mean an open room that can do everything. It means crafting innovative environments that address different levels of privacy and different sizes of groups.

In order to alleviate the anxiety that comes with planning a new facility, education leaders should focus on the "why." Dig into the granularity of a facility's purpose and embrace questions on success drivers and disruptor trends that form the right framework of a building program.

You will then uncover truths rather than repeat dated assumptions. The goal is to encompass present and project trends for the future. That starts with asking the right questions. ■

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