A4LE LE SOLUTIONS PLANNING & DESIGN AWARDS **CONTENTS**

UNIVERSITY OF CINCINNATI
ENGINEERING AND APPLIED SCIENCE LEARNING CENTER

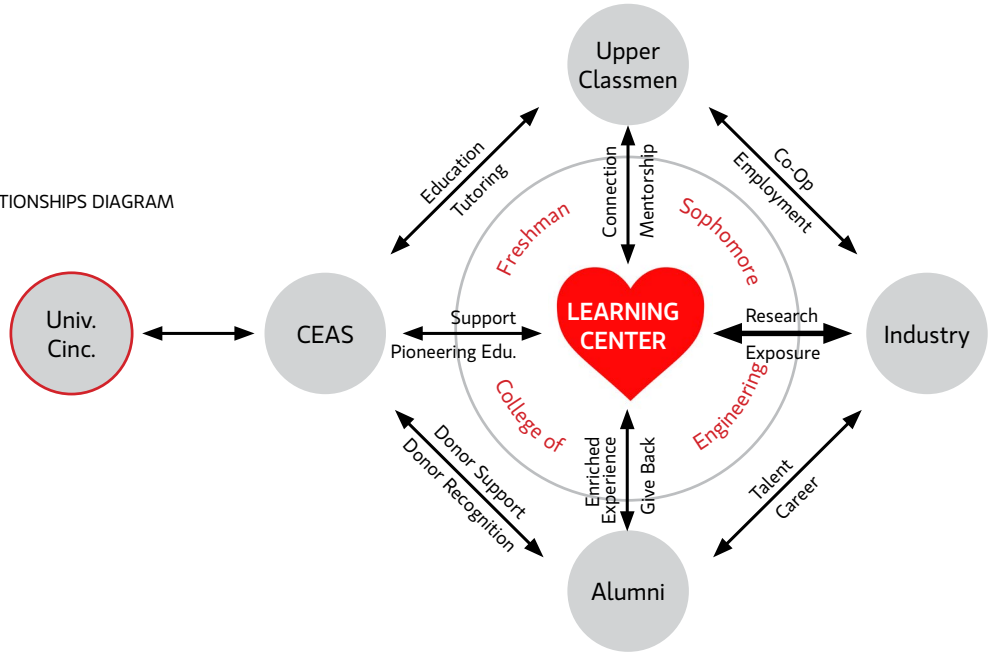

LEARNING CENTER
COLLEGE OF ENGINEERING & APPLIED SCIENCE
Questions?
IN APPRECIATION
ROBERT & ROSE FEALEY

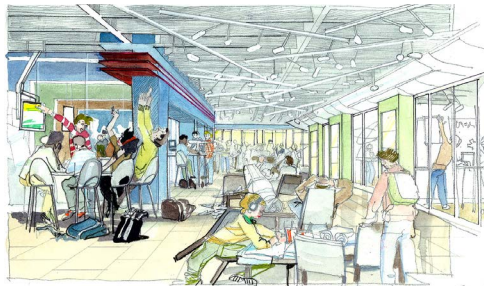
EXECUTIVE SUMMARY

"UC has a long-standing tradition of excellence and a long-standing tradition of opportunity. Our mission is as true today as it was 100 years ago when Dean Herman Schneider created cooperative education right here in the College of Engineering. Today we embark on a new tradition—one that ***will provide a unique educational opportunity and nurturing experience for our students and transform the educational process*** *here at UC."*

Carlo Montemagno, Ph. D
Dean, College of Engineering and Applied Sciences

COMMUNITY RELATIONSHIPS DIAGRAM





The traditional "sink or swim" approach to engineering education resulted in low retention rates in U.S. engineering colleges and universities. It was traditionally an accepted fact that within their first two years, as many as half of all engineering students would either fall or otherwise opt out of the program, as in the case of University of Cincinnati's College of Engineering & Applied Science (CEAS).

The new Engineering and Applied Science Learning Center was designed with the goal to improve retention and overall graduation rates of the College's engineering students by providing highly flexible and adaptable space to support the evolving freshman curriculum with as many as 1,100 engineering students entering the program. The facility was designed in alignment with the University's effort to restructure their first-year curriculum and allowed to blur the lines between formal and informal learning—creating social connections between engineering students and enhancing connections between students and faculty.

The Department of Engineering Education (DEE) was established to transform the way undergraduates are educated in the CEAS particularly during the first two years, which most significantly impact student retention. The Engineering and Applied Learning Center is intended to support the newly established DEE and its mission and goals. It is envisioned as the "heart" of the engineering student experience - a student's first encounter with CEAS and one that will leave a lasting impression as the progression from student to learner to practitioner is made through access to academic resources, tutorial services, teaching faculty, and space and amenities that encourage social interaction.

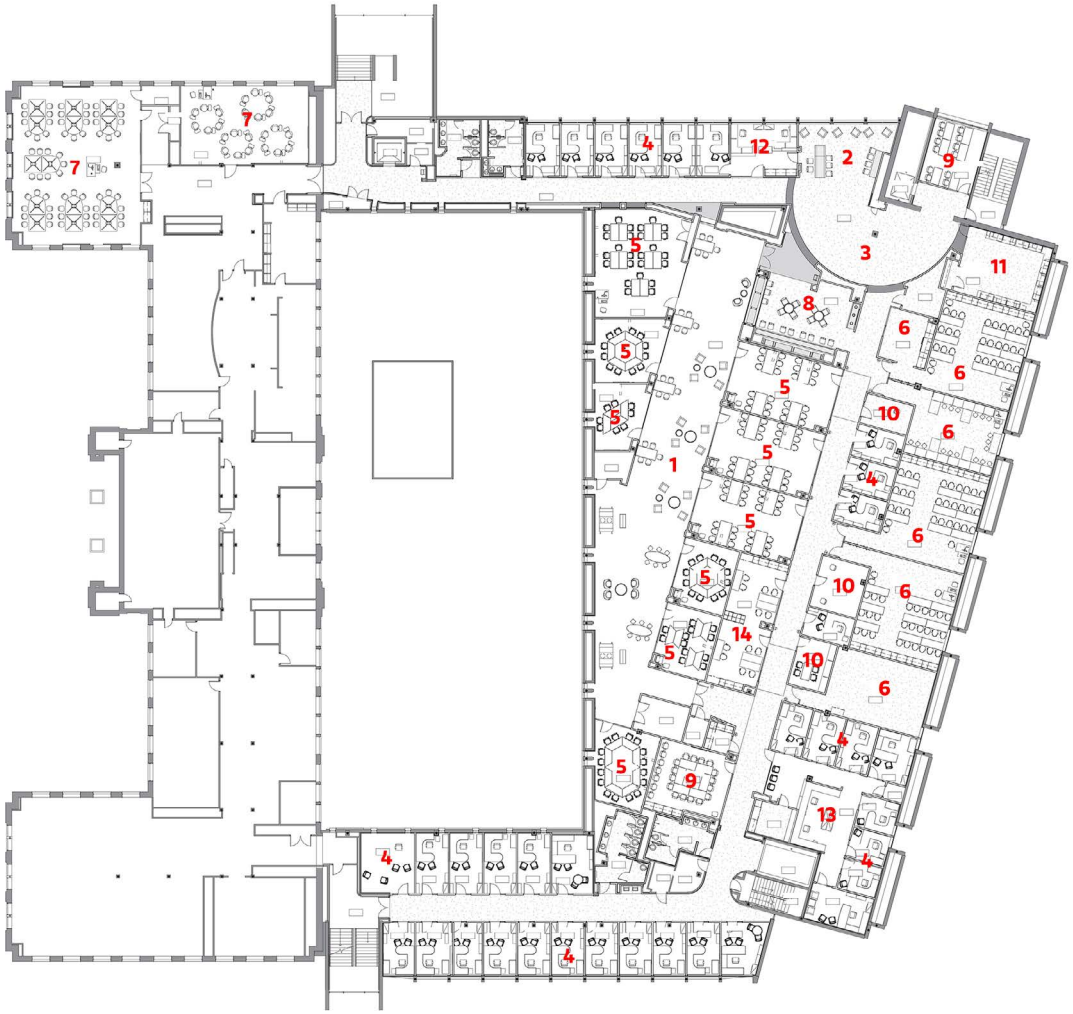
The Engineering and Applied Science Learning Center was created to support freshmen and sophomore learning success by:

- Creating a **dramatic destination** that will become the "heart" of the College of Engineering & Applied Sciences.
- Hosting programs, events and spaces that foster a **sense of community** through opportunities to study, socialize and network together.
- **Expose, engage and empower** students with the futures within engineering they will be defining through connection to industry, alumni, faculty and upperclassmen.
- Providing state-of-the-art facilities for **pioneering** significant advancements in engineering education.

The new Learning Center has not only increased the retention and graduation rates of the College, but has transformed the way students interact, socialize, and learn.


SCOPE OF WORK & BUDGET

SCOPE OF WORK & BUDGET



1 "COLLABORATION ZONE"
2 "THE ORIGIN"
3 ALUMNI WALL
4 FACULTY OFFICES
5 PROJECT LABS / TUTORIAL / CLASSROOMS
6 INSTRUCTIONAL LABS
7 ACTIVE LEARNING STUDIO
8 CAFE
9 CONFERENCE / SEMINAR ROOMS
10 TECH SUPPORT
11 ADJUNCT FACULTY TOUCHDOWN SPACE
12 LEARNING CENTER DEPARTMENT SUITE
13 ELECTRONIC AND COMP. SYSTEMS SUITE
14 STUDENT ORGANIZATION SPACE

ARCHITECTURAL RENDERING

This project consists of renovations to University of Cincinnati's Rhodes Hall, totaling 36,830 NSF. A new 12,200-NSF Alumni Engineering and Applied Sciences Learning Center provides highly flexible and adaptable space to support the evolving freshmen engineering curriculum. The Department of Engineering Education (DEE) recognizes the importance of small group and hands-on activity to the learning process and has structured the new curriculum to be a mix of lecture and project-based activities. Using this information, a variety of spaces were developed to support the new curriculum:

- **Active Learning Studio** – a state-of-the-art, active learning, experimental classroom to seat 60
- **Maker Space** – 20-seat project space to support breakout activity associated with lecture courses
- **Team-Based Learning Classroom** – flexible 25-seat, technology-enhanced, instructional spaces
- **Learning Communities** – small collaborative group rooms (6-8 seats) to support engineering learning communities
- **"Collaboration Zone"**—a non-dedicated social/study space located between classrooms designed for multiple types of seating arrangement opportunities
- **"The Origin"**—a help desk area staffed by upper classmen near the elevator

SCOPE OF WORK & BUDGET

EXISTING PROGRAM DISTRIBUTION

BEFORE PHOTOS

The space program for the 800 Level of Rhodes Hall is evenly split between the Learning Center and the School of Electronics & Computing Systems (SECS). The program has been developed to maximize initial functionality for both the Learning Center and SECS as well as to provide opportunity for the Learning Center to expand in the future with the relocation of SECS. As much as possible, spaces are conceived for multi-purpose use and are reconfigurable with movable furniture and partitions. More than 25 percent of the Learning Center program has been developed to be accessible to SECS to maximize the efficiency of available space.

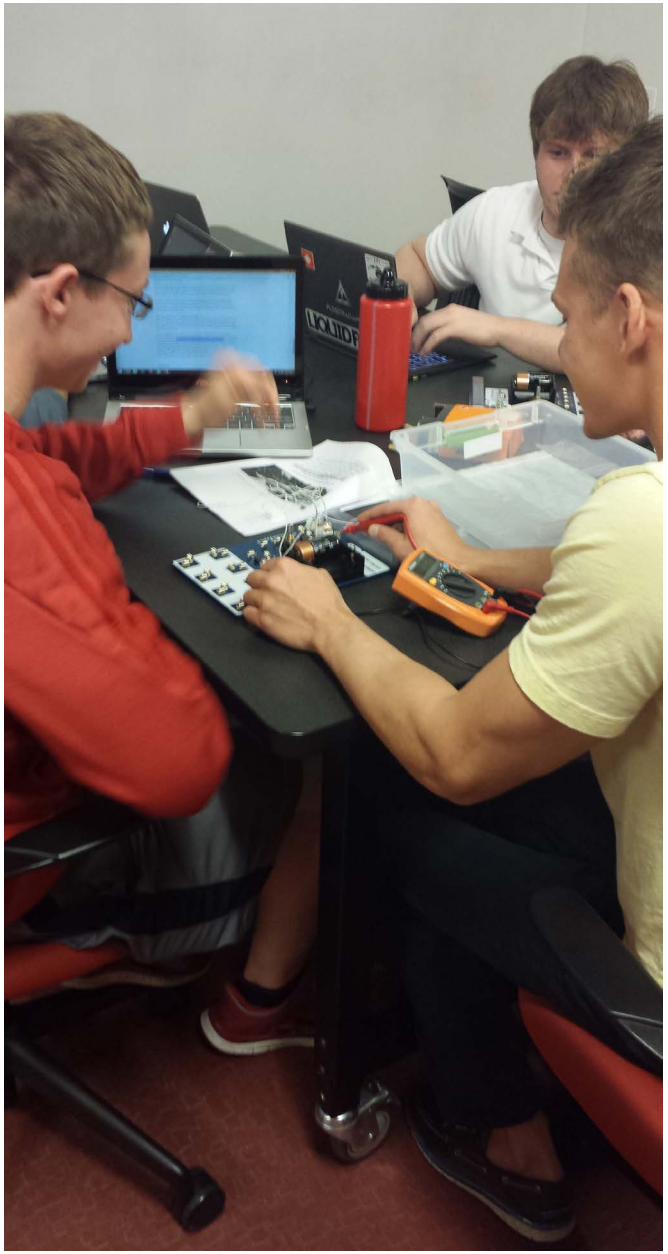
An early step in the development of the new Learning Center program was to understand the capabilities of the floor (bay sizes, access to natural light, building geometry and plan organization, etc.) and the nature of the existing spaces that are part of the 1960's construction. The 800 Level of Rhodes/ Baldwin Hall has a unique set of opportunities and challenges. The design team analyzed the vertical circulation, mechanical space locations, bathroom cores, structural layout, corridor layout, solar orientation/fenestration and the programmatic distribution to develop a basis for redesign on this level. The intention was that the effort to redesign the 800 Level would serve as a model for future renovations within Rhodes Hall.


4.1 Laplace Transform
Improper Integrals
convergent
divergent
Shift formula!!
lenovo

SCHOOL & COMMUNITY ENGAGEMENT

"It's hard to feel like you're an engineer in your first couple of years. The center will enable development of a cohesive unit of people to study with, socialize with, learn with."

Krissten Keese
Graduate, Materials Engineering

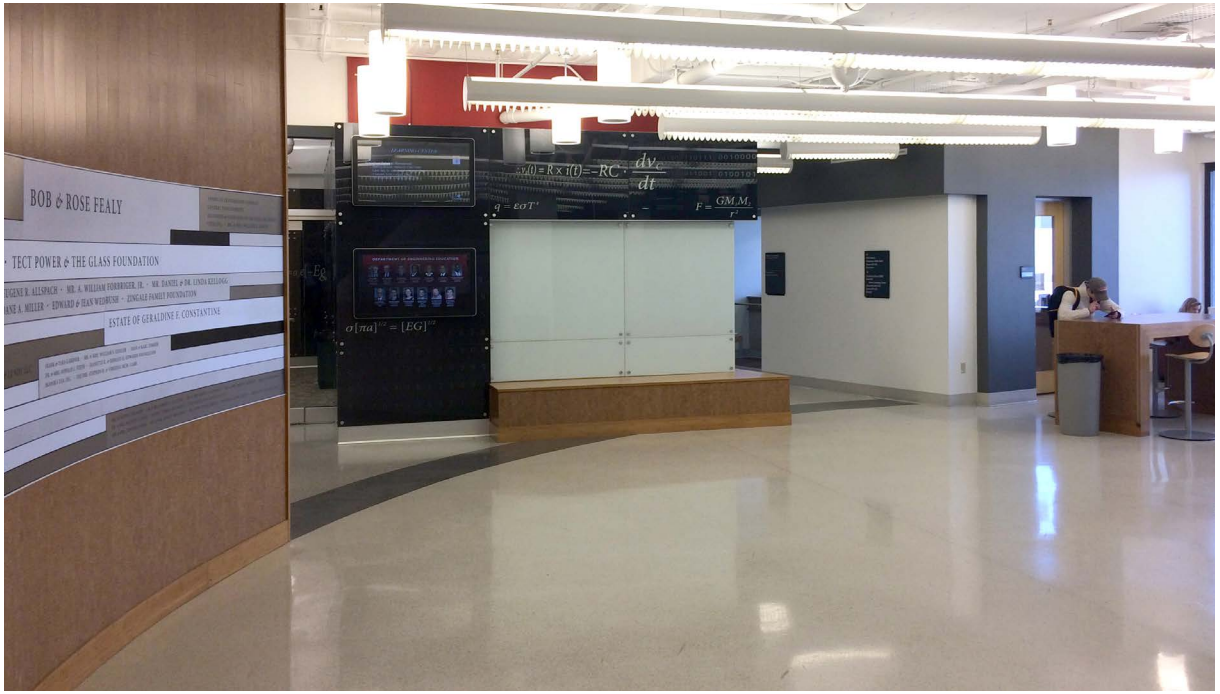


The College of Engineering & Applied Science (CEAS) Learning Center is intended to be a resource for the entire CEAS community. As such, it has many stakeholders. As part of the programming process for the project, a list of design criteria was developed for stakeholder groups to further inform the planning and design phases. The program for the new Learning Center was developed over a three-month period through a series of meetings with leadership, faculty and students of the CEAS Learning Center, including the Department of Engineering Education (DEE), the School for Electronics and Computing Systems (SECS), the CEAS, and the University. University alumni, community donors and students were also included as part of the process. **All stakeholders were on board with the same goal to retain and assist new students to make them comfortable in an environment which encourages connections and collaboration with other engineering students and faculty, while providing them with new flexible and adaptable space in alignment with a revamped engineering curriculum.** The goals did not waiver amongst each of the stakeholders.

Included in the process were visioning /goal-setting sessions as well as program definition and review. The proposed program for the Learning Center was carefully evaluated by all stakeholders and benchmarked against peer institutions, including West Virginia University, University of Notre Dame, Boston University, University of Rhode Island, and North Carolina State University. A benchmark analysis of the other institutions' engineering learning center facility sizes in relationship to their first-year engineering student enrollment was conducted as well. Among the benchmarked learning center facilities, the program for the CEAS Learning Center was the most ambitious. The CEAS program is distinguished by scale, where the size of the projected freshman class was found to be more than twice of the institutions that were benchmarked and was only exceeded by North Carolina State University. It is also distinguished by ambition where it is the only program with a research objective and vision to innovate in teaching, as well as learning.

In addition to benchmarking recently completed projects, utilization of programmed space to support redesigned courses for as many as 800 first-year engineering students was analyzed.

SCHOOL & COMMUNITY ENGAGEMENT



LOBBY

ALUMNI WALL

Spaces have been sized and specified to support scheduled academic courses at a high utilization rate. During this period, the development of the new first-year curriculum, the merger of the CEAS and the conversion from quarters to semesters were all advancing. As the program for the Learning Center developed, it became more clear how this new resource could support the dramatic changes occurring for the CEAS and how it would address the goals of both the College and University.

Some of the challenges that were presented at the onset of the project included the location and age of the facility. The location on the eighth floor of a nine-story building presented a challenge to provide a signature space for the CEAS. It was also a challenge and goal to enhance connections to other parts of the school, such as the library etc., for students to have ease of access to other University facilities and students while having a dedicated space for the engineering program. It was also a challenge to take advantage of natural light in the middle of a floorplan and enhance the use and access to technology, considering the age of the building.

A new lobby provides an opportunity to honor those in the greater community who have donated to the creation of the facility. The lobby features a high-tech space with a donor wall, keeping the donor and alumni community engaged with the college. Various spaces such as the lobby, collaborative zone, etc., hold both College functions as well as public events by community groups.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LEARNING CENT
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EDUCATIONAL ENVIRONMENT

The College of Engineering & Applied Science (CEAS) has a vision to be recognized as a premier college for the delivery, advancement and promotion of engineering education. Their mission is to:

- Assure the delivery of the highest quality teaching and learning experience to CEAS students with a primary emphasis on the first- and second-year courses
- Assist the College in providing the highest quality of teaching in the 3rd through 5th years of instruction
- Advance the scholarship of teaching and learning
- Promote societal understanding of the importance of the STEM field to the economic health of the country

The goal for the project was to increase the retention and overall graduation rates of the CEAS through the Learning Center to retain students while also engaging faculty and allowing them to experiment with different teaching models. The solution for the project surrounds the students with flexible technology and creates a space where first-year engineering students can interact with each other and feel connected to other students and faculty within the CEAS. It was important to create learning landscapes where touchdown, study, project and café spaces provide places for students to linger beyond class time—places where students can build the social relationships that are proven predictors of academic success in challenging STEM programs. It also encourages students to collaborate, lead, and advocate for their ideas.

The Learning Center was programmed to support a broad range of activities including scheduled instruction, independent project work, mentoring, networking and, through interactive displays and technology, exploration of the engineering profession and its global impact. Various programmatic spaces were established to support the curriculum:

- **Active Learning Studio** –the size of the experimental classroom was established at a minimum of 60 seats, accommodating 700+ first-year students in 12 sections. Based on a 45-hour week, this room would achieve over a 50 percent utilization rate, leaving time available for reconfiguration, set up and evaluation associated with the Department of Engineering Education's (DEE) research mission.

EDUCATIONAL ENVIRONMENT

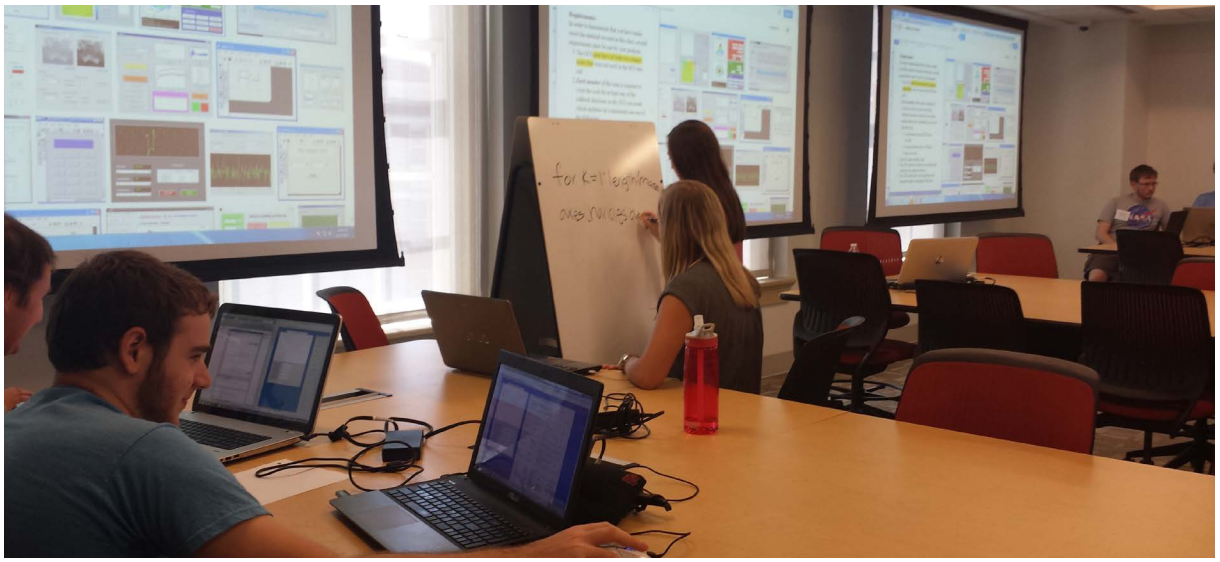
- **Maker Space** – space to support breakout activity associated with these courses was needed to encourage more informal interactions. Three 20-seat project spaces were required to support the lab section of the first-year courses. The program achieves this using multi-purpose and divisible spaces that accommodate scheduled class needs as well as student-driven activities and functions.

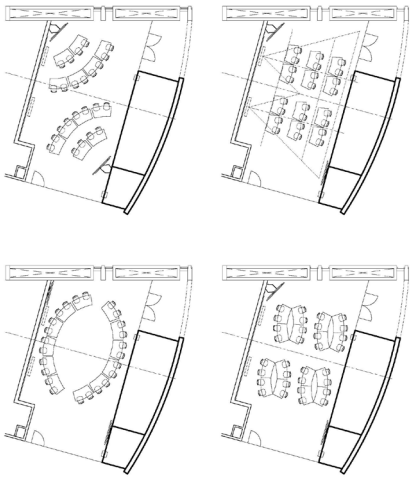
- **Team-Based Learning Classroom** – one course needs access to a 25-seat instructional space that is projected to be scheduled for classes eight hours per week, making that space available for other student-driven activities and functions for much of the time. Three to four classroom types were included in the program to experiment with new ways for teaching and allows for the exploration of various ways to deliver pedagogies and projects.

- **Learning Communities** – the first-year class is divided into 20 student learning communities which meet for one hour twice a week. It was desirable to provide as much of that meeting space as possible within the Learning Center. Flexible space for small collaborative groups (6-8 students) was needed and opportunities to combine those smaller spaces to support the learning communities, informal tutoring and student collaborations were included in the planning process.

- **"Collaboration Zone"** – students are given much needed social/study space with an area located between classroom and seminar rooms where students cross through. It is designed for multiple types of seating arrangement opportunities varying from high-stools, lounge chairs, group tables, etc., encouraging both informal and formal learning including tutor, classroom, study and lounge space. This space has become the 24-hour destination bringing students together in a large studio environment, providing a space to "digest" what they have learned. The spaces are designed to be user adaptable with technology and organic materials in juxtaposition to further accentuate the potential tension between the engineered and natural environment.

EDUCATIONAL ENVIRONMENT





EXAMPLE : FLEXIBLE CLASSROOM CONFIGURATIONS

- **"The Origin"** – A help desk staffed by upperclassmen and faculty serves as a lobby/concierge and welcomes freshmen entering the facility.

All spaces for learning can be convertible from lecture-style, to lab-style to workshop-style spaces with movable tables and chairs where not only teachers but a student, or group of students can address the class, lead a discussion, share content and engage other learners from anywhere in the space. All study, social, and faculty space is co-located in the new facility providing students enrolled in the CEAS with a "one-stop-shop" for their education, allowing them to interact with others who share their interests and personality types in the STEM field. The spaces within the facility allow all learner types to be successful within a space, accommodating every difficulty they may have. Additionally, the Learning Center contains student lockers to support the large commuter population, and emeritus and adjunct faculty resource rooms to provide a faculty presence and enhance faculty student mentoring.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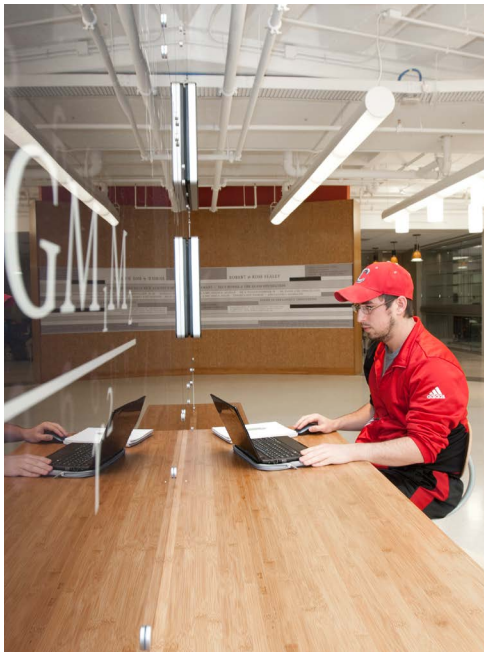
$\sigma = \sigma_0 e^{-Eg/2kT}$

PHYSICAL ENVIRONMENT

"...our aim is to revolutionize engineering education through a dynamic, engaging, immersive learning center that raises the bar and sets the standard for engineering education now and for generations to come."

F. James Boerio, Ph.D
Department Head, Engineering Education



The plan is organized around a collaborative social space that is used to create a welcoming environment for first-year students to foster interaction with faculty and other engineering students. The structure of the building is exposed to create a greater sense of space and natural light.

The heart of this space is occupied by what has been named "The Origin", the main lobby area where upperclassmen and faculty within the Department of Engineering Education (DEE) are stationed as the first point of contact. It provides a welcome area with a concierge and information hub facilitating interaction between students, resident experts, and specialized technology. The inclusion of this space is to break down the boundaries for these young students and enhance their ability for academic success. The design team felt that "The Origin" was an important design element to encourage interaction before students enter the Learning Center, providing a space where upper level engineering students can meet with freshmen students to collaborate. This space also serves to highlight the two major organizing attributes of the contemporary design which "speaks the language" of the engineering students: the "Techno Walls" of back-painted glass with embedded high-technology and the organic shape and material of the serpentine "Alumni Wall" with bamboo. The wall is used to mark key plan intersections and provide way-finding within the plan. The serpentine "Alumni Wall" is used to link the Learning Center, experimental classroom and the Engineering Library which is housed on the same floor level, but located in a separate historic building. The use of these organizing elements shows students the impact of engineering on the future of technology and its place within the natural environment while providing an important connection to the past.

The Active Learning Studio is a reconfigurable classsroom located next to the library, focused on experimentation and research to support the DEE's mission. The Team-Based Learning Classroom supports student projects and other hands-on activities and associated project storage.

The "Collaboration Zone" between classroom and seminar rooms provides transparency with glass allowing students to see into

PHYSICAL ENVIRONMENT

the spaces arranged toward the exterior walls of the building while the flexible enclosed spaces are located toward the interior. All the walls are floor-to-ceiling transparent glass and writable, providing students the ability to look in and see interesting, "messy", flexible, high-tech "makerspace-type" areas, watching and celebrating the art of learning. This space provides collaborative writing surfaces for students to feel connected and sets the tone for today's education and the direction it will go.

As a support space for first-year engineering students, it was essential to maintain a level of comfort that would allow the students to remain engaged while being in the same space for extended periods of time to work on projects, meet with classmates, and seek advisement from upper-level classmen and faculty. The facility has both carpet and rubber flooring to provide flexibility based on demand, and to withstand the rigors of experimentation. The mechanical systems throughout the entire floor are exposed and organized in a manner to promote the building and its systems as part of the learning environment.

Faculty and staff offices were also restructured during the programming phase to wrap around the academic spaces where they are close enough in proximity, but do not disrupt the overall flow and synergy of the facility.


LEARNING CENTER
ENGINEERING + APPLIED SCIENCE

RESULTS OF THE PROCESS & PROJECT

The School of Engineering Education and first-year students in the CEAS now boast an established home as part of their programs and education while providing a setting where students can become immersed and gain hands-on experience in the profession of engineering and applied science. Equally critical, was providing faculty with new flexible, high-tech and adaptable space in alignment with a transformed engineering curriculum.

"What has helped me update my teaching methods is actually the technology and the projection systems and everything that's available in the classrooms as well as the setup of the classrooms themselves. Having the teachers' station in the middle and having the students around allows me to walk around and interact with the students."

Dr. Gregory Bucks, Assistant Professor-Educator

The new facility serves as a signature space within the entire building where a conscious effort is made to include the spaces as part of student tours for new incoming students not necessarily enrolled in the College of Engineering & Applied Science (CEAS). The new center enabled development of a cohesive unit of engineering students that study, socialize and learn together.

The "Collaboration Zone" and other classroom, lecture and lab spaces hold many functions not only tied to the engineering program. Many community members and other University faculty and students use the spaces for their own purposes. When asked in a post-occupancy survey about where they like to study, the majority of freshmen enrolled in CEAS prefer to study in the "Collaboration Zone" where there is access to visual displays, writable surfaces, and space to spread out, work independently or in a group. More than 53 percent of responses preferred engaging with others in the "Collaboration Zone" 'Most of the Time' or 'All of the Time'.

Faculty have also recognized an improved effort of students stopping by their offices, creating enhanced connections between faculty and students and providing them with a better understanding of their learning styles, needs, and areas of focus for improvement.

"I almost feel like a local celebrity because you know all these kids, they say hi to you in the hall, hi when you're walking by, stop by my office for a minute…so I know these students as people and not just students from my class. That's been nice versus in the past when my office was away from where I taught, they didn't stop by as much and I didn't know them as well. So for me the change that I've seen is more interaction with the students.."

Dr. Jeffery Kastner, Assistant Professor-Educator

Due to the success of the new Learning Center, upperclassmen engineering students long for this type of space to assist in their education.

"The learning center has really made my freshman year unique. I feel like it has made me more part of the college because it keeps me here more, it draws me in."

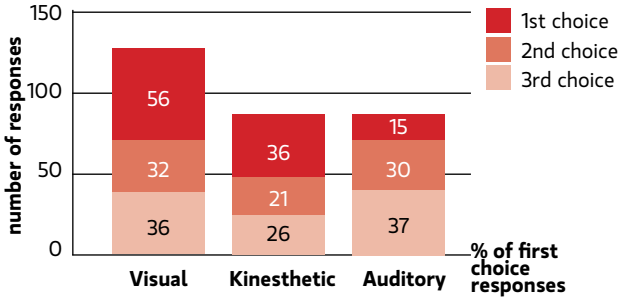
McKenzie Kinzbach, Freshman, Aerospace Engineering

RESULTS OF THE PROCESS & PROJECT

Post Occupancy Survey
Total Respondents: 190
Male : 76%
Female: 24%
Class: Freshman

FIGURE 1

Ranked preference for studying in the learning center



learn by doing	learn by doing		46%
case-based project (group)	case-based project (group)	case-based project (group)	20%
observing demonstration			17%
case-based project (indiv)	case-based project (indiv)	case-based project (indiv)	7%
	discussion / debate	discussion / debate	4%

FIGURE 2

Where students study with others

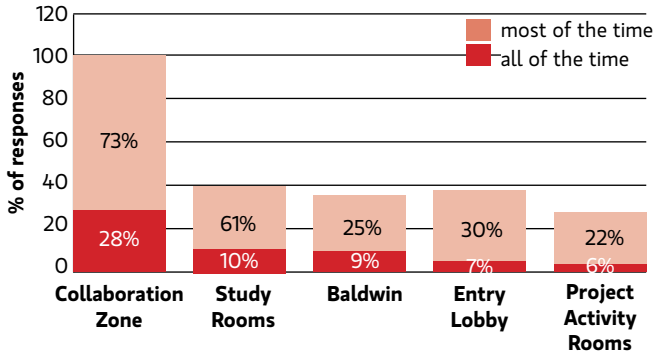
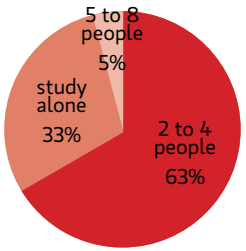


FIGURE 3

How students study in the learning center



A post-occupancy survey was performed at the CEAS Learning Center. It solicited information on how and where students learn and study as well as how instructors develop and perfect teaching methodologies.

Figure 1: The survey was used to first establish the learner types from the students perspective which tie directly to successful pedagogies for those learner types. This ultimately reinforced the types and designs of the instructional environments provided to support those teaching and learning activities.

Figures 2 & 3: Understanding where current students like to study and whether alone or in groups supports the development of those associated architectural components of those spaces in other projects (adjacency, traffic flow, access to light, furniture types, quiet and reflective, active and buzzing, access to specific hardware and software, etc.).