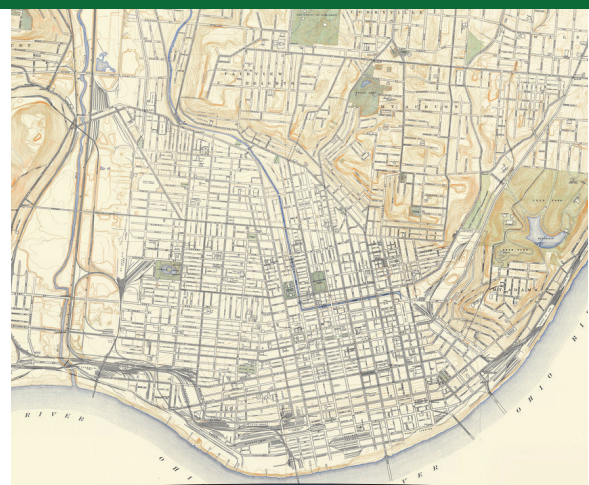


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**Certificate of Research Excellence**

**2019 Recipient Project Profiles**



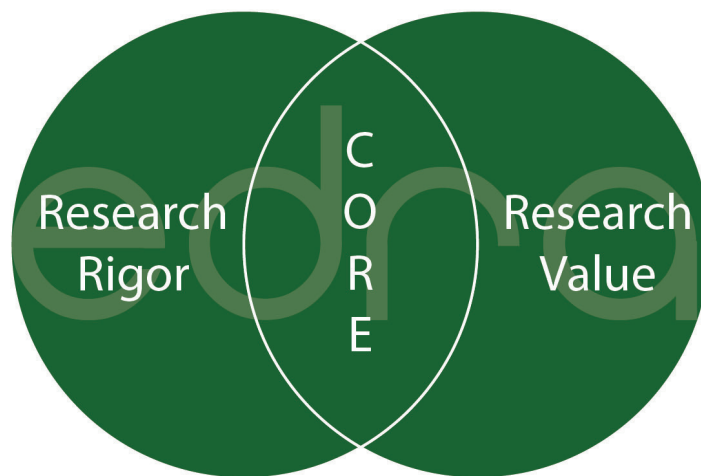
*improving environments through research excellence*

# About CORE

Practitioners who conduct design research as part of their work have much the same interest as academic researchers in receiving validation and credit for the quality of their research efforts. Currently, the credibility of academic research is judged on the basis of well-established protocols and peer-review processes generally associated with the publication of scholarly articles describing their research. However, this means of recognition is not normally available to design professionals, who tend to be focused on project delivery and business, and are less likely to prepare formal scientific reports. The response to this situation, developed by the Environmental Design Research Association (EDRA), is the Certificate of Research Excellence (CORE) program. CORE is a structured evaluation program based on criteria—applied by trained experts—to confirm the quality of practice-based design research.

Applications to CORE undergo a rigorous, double-blind review by an interdisciplinary panel of experts. Evaluations are based on two main dimensions: (1) Research Rigor—the use of recognized scientific approaches (research design, tools, and data collection) and techniques to produce valid results (data analysis and interpretation of findings); and (2) Research Value—the study’s actual (or potential future) impact on the design industry and project stakeholders.

CORE’s unique evaluation framework:



- Identifies practice-based environmental design research that is not only rigorous, but also offers measurable value, meets industry challenges, and advances design thinking;
- Recognizes the importance of design research in practice;
- Provides a compass to guide designers, researchers, organizations, and manufacturers in their design research and evidence-based design efforts; and
- Builds on EDRA’s tradition of inquiry, reflection, collaboration, and commitment to innovation.

2019 was the fourth year for the EDRA CORE program, with eleven projects earning CORE recognition.

# Investigating the Impact of Multisensory Environments for People with Dementia

## MERIT CERTIFICATION

University of Florida, Department of Veteran's Affairs, and Gresham Smith

**Study Team:** Lesa Lorusso, Sheila Bosch, Nam-kyu Park, Ron Shorr, I. Maggie Freytes, Sherry Ahrentzen, and Maureen Conroy

The study took place in 13 facilities, with medical staff and patients with dementia. The purpose of the study stemmed from the fact that quality of life plummets with dementia and drug-based interventions are costly and dangerous. The healthcare organization that partnered with this research has provided multisensory environments (MSE) as therapy since 2011, but they had remained unevaluated. There is also a critical need for research investigating MSE impact on behavior. The purpose of this study was to improve the evidence-base of dementia-focused environments by understanding staff perceptions of efficacy and barriers to uptake of MSE, and investigating MSE impact on behavior.

The research questions consisted of two parts: First, what are barriers to uptake and staff perceptions regarding efficacy of MSE? Secondly, is MSE intervention effective in reducing aggression/agitation during assisted bathing for people with dementia? The variables / outcomes of interest included: (1) Staff perceptions of efficacy and barriers to uptake of MSE, and (2) the impact of MSE on behavior during assisted bathing. The theoretical/conceptual framework was guided by Roger's (1962) Diffusion of Innovation (DOI) Theory; Kovach's (2000) Model of Imbalances in Sensoristaxis guided this observational study.

This was a mixed methods study. First, a systematic literature review revealed gaps in the literature regarding use of MSE for people with dementia. National semi-structured interviews with staff regarding perceptions of barriers to uptake of MSE were conducted. Interview transcripts were analyzed following the Rapid Qualitative Inquiry method for common themes. These findings informed the next part of the study, which was a 20-week experimental clinical trial using the single-case experimental research method investigating the impact of MSE on behavior. Behavior definitions were adapted from the Care Recipient Behavior Assessment tool (CAREBA) from the bathing without a battle (BWAB) literature. A primary observer coded 100% of the data, and a secondary observer coded 20% of the data to reach 80% intra-observer agreement. Frequency and duration of target behaviors were analyzed. The total timeline was one year from IRB approval to completion. The study team included 10 researchers; and there were 27 participants (23 staff and 4 Veterans).

Common themes emerged centered around two primary aims. Aim 1 sought feedback regarding barriers to uptake of MSE, and aim 2 sought staff perceptions of MSE effectiveness for Veterans with dementia. Themes for Aim 1 included: inadequate training, lack of staff engagement with MSE, lack of clear MSE maintenance plan and inadequate accessibility to the MSE. Themes for Aim 2 included: importance of communicating applications, methods and preferences, the key role of design of the MSE, importance of an MSE champion, positive effects of MSE and unintended negative effects of MSE. Across participants, there was an overall increase in positive behaviors like engagement and happiness and an overall decrease in negative, or problem behaviors. Findings support the positive impact of MSE on behavior, and the importance of preferences within the sensory environment.

The findings from this study will be instrumental in providing healthcare design and research teams with much-needed information regarding the impact of MSE on behavior and ways that sensory equilibrium can be influenced by the design of the sensory-based, dementia-focused interior environment thus improving quality of care and quality of life for people with dementia.

[Read the full study report](#)

# Sensory Wellbeing for Adolescents with Developmental Disorders: Creating (and Testing) a Sensory Wellbeing Hub

## MERIT CERTIFICATION

[HKS](#), [ASID](#), [Lane Tech College Prep High School](#), [Lane Tech Alumni Association](#), [University of Michigan](#), [Ouva](#), and [Mohawk](#)

**Study Team:** Giyoung Park, Upali Nanda, Jonathan Essary, Lisa Adams, Melissa Hoelting, and Sean Ahlquist

This study aimed to create a sensory wellbeing hub for students with developmental disabilities in a public high school in Chicago and test the efficacy of the hub. Research questions: How do students and staff use the sensory wellbeing hub? What sensory interventions are used most? How do students with vs. without autism spectrum disorders (ASD) respond to specific sensory interventions in the hub? How are students' sensory profiles associated with sensory intervention usage? How sustainable are the effects of the hub usage; does the effect carry forward into behaviors in real-life environments? And are there indirect effects of the hub on parents, teachers, and paraprofessionals?

Literature review started in March 2017, and a research grant was awarded in May of that same year. The team conducted prototype tests in June through July 2017 and received feedback in a workshop with experts. The hub opened August 2017. Once IRB and RBR approvals were in-hand, study participants were recruited through the school.

This study used sensory profile and wellbeing surveys, focus groups, log-in data, field observations, sensor data, and student records. Staff job satisfaction and staff/parent wellbeing surveys explored the indirect effects of the hub. The study team included a Principal Investigator (PI) with neuroscience and architecture background, a co-PI who is an environmental psychologist/architect, the lead designer, a computational designer, and a research coordinator. Two supporting partners processed sensor data. Twenty boys and 5 girls (12 with ASD), 9 staff members, and 11 parents participated.

Findings include: The hub was perceived as a safe place serving therapeutic and preventive functions. Staff would take a student displaying a sign of distress to the hub. Students could ask for a hub visit when needed. Several students had a scheduled visit. A beanbag and a weighted blanket and a semi-enclosure (the cocoon) and an interactive media wall received most positive feedback and were utilized most. ASD students used a beanbag, musical instruments, pin wall, and aquadoodle more than their counterparts. They used the cocoon less but the musical instruments more during a scheduled visit and used a fan more during an unscheduled visit than non-ASD students. Sensory-seeking students used the cocoon more and the beanbag less. Sensory sensitive and sensory avoiding students used the aquadoodle more. Happy, sustained focus and engaged behavior improved during a hub visit, and the improvements became marginal after returning to the class compared to pre-visit. Wellbeing in school marginally improved between the two post-construction semesters, and ASD students reported better emotional wellbeing than other students in semester. No indirect effects on parents and staff were found.

The study suggests an iterative prototype process is essential. The hub appears to provide immediate effects for students having an outburst and long-term effects through scheduled visits. Modular systems can allow the school to replace underutilized and damaged items. A beanbag and a cocoon are encouraged for future projects. Policy of hub use and an orientation for staff needs to be in place.

The investigation of sensory intervention usage and potential effects over a long time in a real setting was novel. Due to limited time, however, this study was unable to conduct pre/post intervention comparison and had a small sample. The usage of the hub was subject to the school's policy. Most students observed visited the hub without immediate needs; immediate effects of the hub visit might not be uncovered.

[Read the full study report](#)

# Life Building Exchange: Investigating the Intersection of Pro-Environmental Behavior, Place Meaning, and High-Performance Design

[Kriegh Architecture Studios](#), [The American Institute of Architects](#), [The Upjohn Research Initiative](#), [University of Washington Campus Sustainability Fund](#) and the [College of Built Environments](#)

**Study Team:** Julia Ann Kriegh PhD AIA, with contributions from Lynne C. Manzo PhD, Elizabeth Sanders PhD, and Joel Loveland

The design of the physical environment and people's relationship with that environment are both important factors related to energy conservation. While social scientists have developed theoretical frameworks to understand people's pro-environmental behaviors and relationships to place, many have overlooked the role of the built environment—and high-performance design in particular—in that relationship. Conversely, architects focused on high-performance net-zero design often do not seek to understand how people live in and make sense of their environments. Drawing these two approaches together, a mixed-methods study of two housing communities in the Pacific Northwest was conducted to understand people's residential energy use behavior and how that relates to physical and social aspects of their environment as well as their values, identity, and place attachment.

Site 1 was designed to state-of-the-art "green" building codes for low energy use, while Site 2 was built according to more conventional code standards. Methods included the introduction of a treatment (a monitoring dashboard showing a household's energy use) and the administration of a pre- and post-test survey, along with in-depth qualitative interviews of a sub-sample of participants.

Findings indicate that while the energy use scores for both communities were low, miscellaneous electric loads and space conditioning uses consumed over 50% of the total household energy. Additionally, energy use data show that the Green Built Community increased their energy use over the course of the study, while the Code-built Community decreased its energy use. Survey results show that biospheric values and environmental self-identity ratings increased for the Code-built Community over this same time period. Interview data suggests that people will engage in their environment in a way that is likely to be energy conserving when such behavior is supported by their residential setting, when they espouse biospheric values and are attached to and identify with their homes and communities.

Based on the findings, a conceptual framework, Life-Building-Exchange, is offered that encompasses: LIFE—people's values and place meanings; BUILDING—environmental cues; and EXCHANGE—the locus of reciprocal relationships (buildings and behavior) found in high-performance environments necessary to meet net-zero climate change goals targeted by the 2015 Paris Agreement.

[\*\*Read the full study report\*\*](#)



# Investing in Our Future: The Impact of School Modernization

## MERIT CERTIFICATION

Perkins Eastman, District of Columbia Public Schools, and J+J Flooring Group

**Study Team:** Heather Jauregui, Katie Herber, and Emily Chmielewski

It is estimated that 53% of US public schools need renovations or modernizations to be considered in good overall condition, the cost of which would total around \$197 billion. Knowing this level of funding is no small ask for school districts and taxpayers across the country, this study aimed to quantify the broader impact school improvements and modernizations can have on student and teacher well-being, satisfaction, and performance to create justification for the considerable financial expenditure required to upgrade existing schools.

Study participants included faculty and students from nine Elementary and Middle Schools in a single school district in a major metropolitan city in the mid-Atlantic region of the US. The study explored both qualitative and quantitative data related to Indoor Environmental Quality (IEQ). Five of the schools had already undergone modernizations to address IEQ, whereas the other four were only slated for future renovation. The impact of IEQ was selected as the primary area of investigation because recent research suggests a school's IEQ (its daylight, thermal comfort, acoustics, and air quality) can affect student and teacher well-being and performance.

The school district that participated in the study was in the midst of a modernization program, where several aging schools are selected each year to receive full renovations to upgrade the facility and create a high performance learning environment. This study's research questions were designed to determine the value and impact of these modernizations. The hypotheses were twofold: (1) modernized schools would have better IEQ than their non-modernized counterparts, and (2) faculty and students in modernized schools would have improved well-being, satisfaction, and school performance compared to those in non-modernized environments. By assessing the IEQ conditions found in recently modernized schools and comparing them to schools still in need of upgrades, this study was able to quantify the value of the improvements from an IEQ perspective and, ultimately, how this contributes to improvements in school performance.

The study utilized four different methodological components to assess this theory: an occupant questionnaire that assessed students' and teachers' perceptions of the quality of their indoor environment, a drawing and writing exercise to be completed by younger students in the participating schools, on-site IEQ data collection using a sensor network that tracked the numeric performance of the indoor environment, and archival data review of student and teacher performance through information already collected by the school district (e.g., test scores, absenteeism rates, nurse visits). Data was collected over approximately six weeks during the winter and early spring of 2018.

Aligned with the study's hypotheses, the results of this study indicate that from an IEQ perspective, modernized schools showed statistically significant improvements over non-modernized schools. Faculty and students alike were more satisfied with IEQ in modernized classrooms; and actual IEQ improvements measured on-site support this increase in perceived satisfaction. Overall, this study supports the continued funding of modernizations of existing school building stock, using high-performance design strategies in order to support the well-being, performance, and satisfaction of those who teach and learn in school buildings.

The study's findings were shared broadly through relevant industry publications and conferences that targeted both school administrators and K12 designers. The study has many benefits for designers and school districts, including justification of major capital expenditure; accountability to constituents and stakeholders; and design guidance for replication or fine-tuning of future school modernizations, which can also contribute to greater efficiencies of future spending. It also further exemplifies the benefits of good IEQ on building occupants.

[Read the full study report](#)

# Good Design Is Good for Loyalty: Findings and Implications from a Multi-Hospital Inpatient Room Post-Occupancy Evaluation

## MERIT CERTIFICATION

Gensler and Cleveland Clinic

**Study Team:** Travis Tyson, James Crispino, Michelle Gandolf, and Nicholas Watkins

Some studies indicate that inpatients tend to draw a distinction between the inpatient setting and their experiences, especially with regard to perceived care quality (Campos et al., 2013, Watkins & Siddiqui, 2016). An exploratory study of 664 former medical surgical inpatients from 12 hospitals had the following objectives: 1) identify meaningful experiences inpatients value from their overnight hospital stay in a private room; 2) explore relationships between the meaningful experiences and patient loyalty; and 3) test the hypothesis that the new hospital inpatient rooms would outperform the other 10 hospitals on meaningful experiences patients value.

The former inpatients who qualified for and participated in the study each responded to a web-based questionnaire with items measuring the patients' experience during their last overnight stay on a medical-surgical inpatient unit. The web-based survey was open for three-and-a-half weeks during May and June of 2018.

Factor analyses of the survey data revealed three latent variables; these factors were used in future analyses. The study also revealed that facility design had a relationship with patients' loyalty behavior, with consistency between an inpatient room's design and the healthcare system's brand and perceived control during the inpatient stay predicting patient loyalty. Further analyses revealed that perceived control was also a strong predictor and characteristic of an adaptive patient room environment. The new hospital outperformed the other hospitals on several aspects of the inpatients' experience within the patient room. Further analyses indicated that an adaptive patient room environment was a strong predictor of patient loyalty to the new hospital.

The project team's members are using the findings to inform facility branding and design and digital design concepts within inpatient rooms and units. Implications include enhanced room controls and a reconsideration of materials and finishes, bathroom layout, family zone amenities, and the care provider zone.

Report pending

# Designing for Extremes: Using Techno-Ethnography and Immersive Empathy to Shape Inclusive Architecture

[HGA](#) and [University of Virginia](#)

**Study Team:** Amin Mojtahedi, d'Andre Willis, Bryan Cannon, Abi Kallushi, and Caroline Bertier West

University of Virginia's Student Activities Building (SAB), mainly serving as a performance and rehearsal space for students, is a 35-year-old building located on the west side of the original Academical Village designed by Thomas Jefferson. Due to SAB's inability to support student performers' needs, a team of designers, researchers, and student body representatives was formed in the spring of 2018 to study, rethink, and redesign SAB on the UVA campus—referred to as Grounds.

The study engaged over 200 students from its initiation in January until its conclusion in April. The research and design team used Design Thinking methodology, as a form of Participatory Action Research that integrates the element of design into the process, to (1) develop insights about students' relationship to SAB in the larger context of Grounds; and (2) imagine ways of making SAB a successful place on UVA Grounds through the process of co-creating its architecture.

To address these goals, the team started by coupling principles of ethnography with digital mapping technology to understand participants' thoughts and emotions underlying their actions and behaviors. We combined the results from a digital, interactive, spatial mapping tool (thin description) with immersive empathy, observation, and focus groups (thick description). Studying students' patterns of movement and distribution of various amenities on Grounds provided the team with insight into the network of paths and their relationships to their adjacent experiential, historic, or programmatic nodes and hubs on Grounds.

This study revealed that all successful places on Grounds provide an overlap of three types of amenities: social, intellectual, and cultural. We named this particular pattern the 'UVa Venn.' SAB, in its current status, was not supportive of the UVa Venn; therefore, the building needed to be either relocated to where the other types of amenities already existed or programmatically complemented by the missing social and intellectual amenities.

To provide ethnographic thick description for the mapping study, the team also explored the needs of SAB's mainstream and extreme users through immersive empathy as a form of participant observation. The underlying idea for this study was that people or groups who exhibit extreme behaviors, amplify the needs and desires of the rest of the users. In a way, if we solve for extremes, we solve for everybody. The results from the immersive empathy challenged the team's original hypothesis: a well-equipped and well-designed performance space supports the needs of SAB users.

During immersive empathy, the team discovered that novice performers' expectations from SAB are fundamentally different from professional performers which requires for the building to serve multiple roles. The professional performers were those who organized large Salsa events, engaged in intense rehearsals, and played giant tuba and 6ft-tall upright base for which they required advanced sound and lighting systems. The novice performer, on the other hand, came to SAB to socialize, bond with members of their student organization, and peripherally participate in activities offered by other student organizations. Programmatically, what this meant was the emphasis on having the right capacity of quality multi-purpose spaces in SAB accessible to a large group of student body who would use the building as a resource for socialization and hosting meetings and events. For the professional performer, however, this meant having the right capacity of quality specialized spaces accessible to host rehearsals and performances.

The research and design team used the analysis to co-create several design options in two participatory ideation workshops. The final design option expressed the coupling of social and intellectual amenities to boost SAB's social permeability to diverse student groups with an elevated cultural significance as a hub of arts and performance on Grounds.



# Process-Led ICU Design: Applying Discrete-Event Simulation and Process Improvement to Measure ICU Design Performance

EwingCole and Binghamton University Systems Science & Industrial Engineering and Watson Institute for Systems Excellence

**Study Team:** Alice Gittler, Farouq Halawa, Sreenath Chalil Madathil, and Mohammad Khasawneh

Discrete event simulation and lean methodologies were applied during a process-led approach to intensive care unit (ICU) design that engaged stakeholders and designers in an iterative manner to assess the advantages and trade-offs of multiple design and operational scenarios. Simulation, detailed workflow studies, and spatial analysis informed the optimal location of key support resources and team workspaces; and was used to predict visibility and circulation patterns. While studies have confirmed the effect of the designed environment on outcomes such as nursing workflow efficiency, patient safety, and interdisciplinary care coordination, fewer have incorporated predictive modeling to inform stakeholder and decision-making during the design process.

This project applies discrete-event simulation model with spatial configuration analysis during the design of three ICUs to measure and predict optimal locations and number of key support resources (e.g. medication and linen dispensing) as well as circulation patterns, peer and patient co-visibility, “bumpability” or staff interaction potential, and improved workflow efficiency as measured by a reduction in non-valued added activities.

The project involved a multi-method approach that incorporated data collection of patient volumes; detailed process mapping of patients, nurses, physicians, and facilities during design workshops; time and motion studies, and one-on-one interviews with clinical teams. A current state simulation model of the existing three ICUs and multiple iterations of the future state designs (coinciding with design development) were created and tested based on the detailed flows, process time, and census data. In addition, 10-year review of design and operations research scholarly literature informed method development.

The simulation models measured seven outcomes: patient visibility, proximity, bumpability, circulation patterns, capacity, and staff in-transit time. Findings that influenced ICU design and stakeholder decision making included 1) dual corridor access to medication and nourishment areas reduced time in transit for nurses by 15%, 2) a single centralized medication dispensing unit for a 20-bed unit provided the same benefit as two decentralized medication dispensing units, and 3) traffic at one of two interdisciplinary team workspaces was predicted to be double that of the second workspace due to the proximity to supplies.

Previous work on ICU simulation modeling has focused on primarily on measuring capacity. While important to this study, adding a novel node passing metric with spatial analysis to predict circulation based on workflow directly influenced stakeholder decision making regarding how the location of resources and team stations could impact care coordination and provided direction on workspace acoustical needs. Likewise, simulating workflows provided direction on number and location of key support resources. This process-led approach served as a proof of concept to apply mixed methods during design development to engage stakeholders and designers in assessing the advantages and trade-offs of multiple design and operational scenarios.

[Read the full study report](#)

# New Parkland Hospital Facility Evaluation

## MERIT CERTIFICATION

[Blue Cottage Consulting](#), [Corgan](#), [HDR](#), [Herman Miller Healthcare](#), [Mitchell/focusEGD](#) and [Parkland Health & Hospital System](#)

**Study Team:** New Parkland Hospital Research Coalition: Jeri Brittin, Jackline Opollo, Lonnie Roy, Renae Rich, Robert Agosta, Doug Bazuin, Kaitlin Blakemore, Leticia Blea, Leslie Echols, Gena English, Kathy Harper, Francesqca Jimenez, Tina Larsen, Cyndi McCullough, Lori McGilberry, Kathy Okland, Susan Partridge, Susan Puumala, Minakshi Raj, and Juliet Rogers

The study addressed a large, urban safety-net hospital that opened in 2015 and serves primarily high need, ethnically diverse, underserved, unfunded, or underfunded residents. The hospital always has ranked highly among the busiest public hospitals in the U.S. and currently registers more than one million outpatient visits and more than 300,000 urgent and emergent care visits per year. Given the new hospital's high patient volumes and breadth of patient populations served, as well as the organization's strategic orientation toward research and academic affiliation with a local university, the facility is seen as a key component of the 'living laboratory' and in the early years of the project cycle was a Pebble Partner Hospital, participating in the evidence-based design (EBD) process promoted by the Center for Health Design. As such, there was a compelling case supporting a comprehensive and unbiased evaluation of the new facility.

This research serves to support the hospital's reputation for quality research, advancing healthcare design research to understand the impacts of facility decisions that lead to use consistent with design intent, and ultimately improved outcomes. Many tenets of EBD were included in the design of the new hospital, including a decentralized nursing model with charting stations between patient rooms, innovative designs to improve supply efficiencies, and a comprehensive wayfinding system. That said, the existing empirical evidence upon which to base supporting key strategies remains limited, creating a need for credible research that aligns with the hospital's strategic plan, and that also will add to the scientific evidence base informing healthcare design decisions.

In the Spring of 2016, individuals, firms, and hospital representatives involved in the development, design, and construction of the new hospital, all of whom wanted to understand the impacts of the new facility design on both patient and staff populations, formalized a Research Coalition to evaluate use and effectiveness of the new facility in comparison to the previous facility. The study explored and analyzed staff perceptions and experiences related to the performance of the facility, the effectiveness of supply logistics related to the design, the change to a decentralized nursing unit design, and the operational adjustments and support that coincided with the physical environment change.

Qualitative information from nursing staff were gathered using focus groups, and an online survey supplied quantitative data from a broader sample of those who work in the new hospital facility. Using secondary data already collected by the hospital, analyses compared acute inpatient outcomes and supply use data in the old and new facilities. The patient outcomes analysis focused on statistical differences between the old and new environments based on length of stay, medication events, hospital-acquired conditions, and falls for adult acute patients and length of stay, medication events, and hospital-acquired conditions as well as growth and feeding patterns for neonatal intensive care unit (NICU) patients.

Results from this study not only provide evidence as to the effectiveness of the new design as it applies to patients and staff in the study hospital, but contribute to the body of EBD research and help inform future healthcare facility plans and projects.

[Read the full study report](#)

# The Impact of Lighting, Noise, and Design on a NICU Environment

[HGA](#), [GBBN](#), [Smith Hager Bajo](#), [S&ME](#), [Affiliated Engineers, Inc](#), [THP Limited](#), and [Turner Construction](#)

**Study Team:** Terri Zborowsky, Jennifer Christmann, Andrea Wilkerson, Kara Freihoefer, and Rebecca Sanders

This research project emerged from a new construction, shell space build-out project of a neonatal intensive care unit (NICU) at a large Midwest academic medical center. Institution leadership were interested in moving from multi-bed NICU rooms (up to 6 babies in one room) to private rooms. It was acknowledged that this change would be extensive for all involved—therefore, there was a desire to use research tools to help inform design decisions and illuminate specific user needs.

Following the completion of the design process and during construction, a larger professional group was engaged in discussions about research and a pre/post-occupancy study was determined to be a high priority.

In the pre-design study, a systematic approach was devised to collect quantitative and qualitative pre-occupancy data that truly captured the “Voice of the Customer” (VOC) for the NICU. To do this, customized questionnaires were distributed to both staff and family members to understand significant predictor variables of the indoor built environment relationship to work performance and perception of care. For example, predictor variables included noise level, electric light, amount of work surface area, and availability of work stations.

[Read the full study report](#)

# Evaluation of New Nebraska Community Hospital Facilities

## MERIT CERTIFICATION

### HDR, Great Plains Health, and Fremont Health

**Study Team:** Francescqa Jimenez, MS, Renae Rich, MS, Susan Puumala, PhD, Susan McDevitt, MSN, ARNP, Lori Schoenholz, RN, MSN, Melinda Kentfield, RN, MSAS, Christine Hurst, PhD, and Jeri Brittin, PhD

Two rural community hospitals participated in this study. Both facilities transitioned to a decentralized nursing model through renovations to their inpatient units. Key stakeholders included management, staff, and patients at both Hospital 1 (H1) and Hospital 2 (H2), as well as researchers, clinical planners and architects. The central hypotheses of this research were that the change from a centralized to a decentralized nursing model would be effective from a nursing perspective and increased desirable patient outcomes.

Qualitative data from nurses were collected through six focus groups; two at H1 and four at H2. Nurse experience was measured quantitatively through a survey which included key organizational outcomes. Patient records were obtained from both hospitals before and after the move. Length of stay (LOS) was analyzed using a proportional hazards regression model and a time series analysis where applicable. HCAHPS scores were also obtained from both hospitals as a measure of patient satisfaction, and were assessed using logistic regression and time series analysis. Twenty-eight caregivers participated in focus groups across both sites.

Findings indicated that nurses define quality of care in human terms (e.g., holding hands, listening), rather than in quantitative outcomes (e.g., errors). Caregivers felt that the decentralized design placed them closer to their patients and improved nurse-patient communication and patient education. However, a majority of nurses believed that communication and teamwork were compromised by the new design. The focus groups also revealed the challenges of change management. There was a lack of understanding for how the decentralized design would affect not only patient care and documentation, but also nurse activities like dispensing medications and responding to calls for help from other caregivers.

A total of 73 and 152 staff members participated in the survey at H1 and H2, respectively. No differences by site were found. Scores on the change leadership scale were associated with commitment to change; with both increasing together. Scores on the change leadership scale were associated with collaboration, with an increase in one predicting an increase in the other. There were a total of 7,408 patient encounters from H1 and 7,797 patient encounters from H2.

A significant interaction was found between time and unit type in H2. The regression model found a significant decrease in LOS in the post period compared to the pre period in the women and children unit and a significant increase in LOS in the ICU. At H1, there was no effect of time on LOS, with both periods showing similar results. An interrupted time series model also found no differences in LOS over time.

A total of 1641 individual HCAHPS records from H1 were included. The positive responses to quiet at night, hospital rating, and recommend hospital all trended higher over time. However, the trend was not different in the pre and post period. Positive responses to receiving help as soon as needed fell after the move into the new setting. No other HCAHPS question changed substantially after the move into the new building.

At H2, a total of 1649 encounters were included. In regression analysis, positive responses for quiet at night and hospital rating increased in the post period compared to the pre period. Time series analysis found an increase in positive ratings for always quiet at night and hospital rating at the time of the move, suggesting these differences may be due to the new setting. Always receiving help as soon as needed trended lower over time, but no change in trend after the move. No other HCAHPS questions changed substantially after the move into the new building.

[Read the full study report](#)

# Evaluation of Higher Education Science Laboratory Learning Environments

[HDR](#), [Bellevue University](#), and [University of Nebraska-Lincoln](#)

**Study Team:** Francesqca Jimenez, MS, Renae Rich, MS, Susan Puumala, PhD, and Jeri Brittin, PhD

This study informs the field of evidence-based design with empirical research about how science laboratory classroom design can address higher education's imperatives to enhance both student learning experience and faculty teaching practice in science, technology, engineering, and mathematics (STEM) disciplines.

The design of higher education laboratory classrooms is a significant area of interest especially because of the high demand for training in STEM fields, and the speed by which technology advances in these fields. However, current evidence is limited regarding the design of classroom environments in general, and in classroom laboratory environments specifically. There has been little focus on the synergy between teaching practice and environmental affordance, and on student learning experience in laboratory classroom environments.

The participating sites in this study are R. Joe Dennis Learning Center lab classrooms at Bellevue University in Bellevue, Nebraska, and undergraduate chemistry laboratory classrooms in Hamilton Hall at the University of Nebraska-Lincoln in Lincoln, Nebraska. All facilities are recently renovated undergraduate STEM laboratory classrooms that had not been updated in decades.

The central hypotheses of this research are that architectural design decisions for STEM laboratory classroom environments (1) have been effective from a faculty and staff perspective at facilitating development of curricula and effective teaching practice, and (2) have supported student learning experience and psychosocial processes.

Instructor experience was assessed qualitatively using semi-structured interviews conducted with professors across both universities. Additionally, 28 students at Bellevue University and 46 students at UNL participated in an online survey that contained validated measures of environmental satisfaction, student engagement, motivated strategies for learning, inspiration, and perceptions of the science laboratory environment. Student qualitative feedback was also recorded via survey comments.

Findings suggest that from the instructors' perspective, the new STEM laboratory environments: facilitate their main goal of teaching students to think like scientists; improve student lab safety; increase student collaboration among peers and interaction with instructors; propel a desire to do more research, both among students and staff; afford the space and equipment to expand and adapt the curriculum; and provide the flexibility to both make changes on the fly, and accommodate any future developments in pedagogy or practice.

Students at both universities rated their level of Student Engagement in STEM classes positively, and indicated a high level of dedication to their studies. On the Motivated Strategies for Learning scale, students demonstrated a willingness to persevere when faced with challenging learning tasks and were shown to have a high level of intrinsic motivation to achieve their academic goals. Bellevue students noted feeling inspired in their STEM laboratory classrooms and by their instructors' innovation in class. Finally, students showed high levels of satisfaction on the Science Laboratory Environment Inventory, expressing positive feeling about both the social and physical environments of their STEM classes.

[Read the full study report](#)