BIOMEDICAL SCIENCES
INNOVATION CENTER
of ST. VRAIN VALLEY SCHOOLS

CASE STUDY
SEPT2019-MAY2021

HOSPITAL ROOM OF THE FUTURE

HOW MIGHT WE enhance and elevate experiences between medical staff, patients, and healthcare environments?

THE PARTNER

UCHealth is a not-for-profit health care system, headquartered in Aurora, Colorado. The system includes hospitals and facilities throughout Colorado, along with affiliated hospitals in Wyoming and Nebraska.

The system includes an academic medical center, UCHealth University of Colorado Hospital, which is closely affiliated with the University of Colorado School of Medicine.

UCHealth institutions push the boundaries of medicine by improving healthcare through innovation. Longs Peak Hospital and specialty practices throughout the Rocky Mountain region have rapidly gained a reputation for excellence – combining academic-based and community-focused medicine, with leading-edge technology and innovation.

uchealth

THE GOALS

Through a partnership between the Innovation Center (IC) of St. Vrain Valley Schools and UCHealth, bioscience students were challenged to create the **'Hospital Room of the Future'** by utilizing the **design thinking** process.

Between September 2019 and May 2021, students empathized with UCHealth staff, visited multiple healthcare locations, designed solutions for existing challenges, and presented their findings to regional leaders within the UCHealth system.

During this project, students, teachers, and healthcare professionals hoped to:

- Increase hands-on collaboration between students and healthcare
- Allow students to self-identify solutions to critical issues
- Build empathy between students and various healthcare careers
- Build professional skills to showcase and share research

'Hospital Room of the Future'

An initiative powered by UCHealth as the organization tests emerging technologies within its hospitals and facilities.

Design Thinking

"Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success."
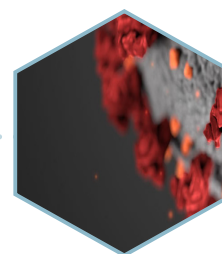
- Tim Brown, IDEO

"Students studied the challenges faced by healthcare today and explored ways to create new solutions by approaching a challenge using the scientific process."

– Dr. Richard Zane, UCHealth
Chief Innovation Officer

[SPRING 2019]
Initial Planning Discussion
IC & UCHealth (Catalyst Bldg.)

[SPRING 2020]
Project Team Worked through
Challenges of COVID

[FALL 2020]
Students Empathized with
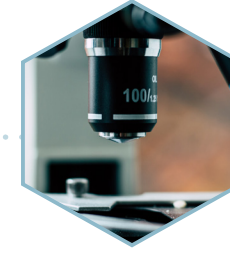Doctors, Nurses, & Other Staffers

[FALL 2020]
Students Began to Visit Multiple
UCHealth Facilities

[MAY 21, 2021]
Teams Presented to UCHealth
Leadership at Innovation Center

[SPRING 2021]
Students Built Prototypes
& Acquired UCHealth Feedback

[SPRING 2021]
Students Researched
& Ideated Solutions

[FALL 2020]
Design Teams were Formed
& Defined Challenges

THE PROCESS

Each and every division of the Innovation Center encompasses some level of design thinking. During this project, our bioscience, student designers walked through each phase – Empathy, Define, Ideate, Prototype, Test – to develop a solution for the identified challenge.

The following teams were formed in the Fall of 2020.

Design Teams

- ICU 2.0
- Team C.U.T.E.
- The Home-Tech Team
- UClarity

Before identifying a problem to tackle, teams engaged in the first phase of the design thinking process – **EMPATHY**.

UCHealth allowed student designers to tour **Longs Peak Hospital** – located in Longmont, CO – to learn more about the medical and hospital system. They visited multiple areas within the hospital including patient rooms, surgical suites, ERs, and birthing suites. Students gathered information about medical care within hospitals by talking with patients, doctors, nurses, and other hospital staff.

Students also visited the **UCHealth Virtual Health Center** – located in Aurora, CO **–** to gather information about virtual health, a growing sector of healthcare focused on telehealth, sensor use cases, and other innovative technologies.

Students then **DEFINED** a specific problem they observed during the empathy phase and began to **IDEATE** how to remedy the problem. This involved intense research and brainstorming sessions with their teams. As student designers, employed by the Innovation Center, project team members were paid $15/hr to develop this research.

In the Spring of 2021, students were then prepared to build the final **PROTOTYPES** of their designs. Teams selected various ways to demonstrate solutions.

Throughout the project, teams were able to **TEST** their theories alongside healthcare experts. One example involved a visit to the **UCHealth Innovation Center**. Teams met with experts, pitched their ideas, answered questions, got feedback, and discussed next steps.

ICU 2.0

Designed a more effective ICU room in order to improve patient, staff, and family comfort and ultimately patient healing.

Defining Question

How might we improve comfort and – ultimately – the healing process for patients in the ICU?

Initial Ideas

- use a Murphy bed to utilize space
- dedicated space for personal items and family gathering
- use cameras to allow family and patients to communicate
- tiled screens for multiple interfaces
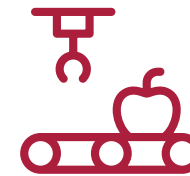
Prototype

A miniature diorama of a newly created ICU showcasing use of space and the necessary equipment for treatments

Test

Teams visited the UCHealth Innovation Center to get feedback on their initial designs and followed up with professionals regularly.

Student Designers
Denisse
Sophia
Talya

Team C.U.T.E.

Designed an autonomous robot to deliver food around the hospital to free up hospital staff time and resources.

Defining Question

How might we automate food delivery to free up resources and staff time?

Initial Ideas

- a robot to implement programmed routines for food or medication
- a drone to deliver supplies in emergency situations
- creating a device that monitors non-traditional vitals

Prototype

Students created a Balsa Wood model of a food delivery robot and modeled a sensor array to pair with the robot.

Test

Teams visited the UCHealth Innovation Center to get feedback on their initial designs and followed up with professionals regularly.

Student Designers
Alex
Jocelyn
Mia
Ryan

The Home-Tech Team

Developed a monitoring device allowing patients to recover at home – relaying real-time data to hospital staff.

Defining Question

How might we utilize technology to transmit patient data from home care environments?

Initial Ideas

- a wearable device patients use at home, connecting them to healthcare systems
- a drone to deliver supplies in emergency situations
- creating a device that monitors non-traditional vitals

Prototype

Students created a 3D printed watch, taking weight, fabric, sensor placement, and measurable vitals into account.

Test

Teams visited the UCHealth Innovation Center to get feedback on their initial designs and followed up with professionals regularly.

Student Designers
Bailey
Brielle
Eva

UClarity

Developed a pair of glasses and a phone application that work together to help nurses prioritize alarms and patient needs.

Defining Question

How might we improve 'alarm fatigue' experienced by nursing staff?

Initial Ideas

- a watch utilizing color and vibrations
- Isolating perimeter alarms to designated staff
- Earpieces used to monitor alarms
- Google Glass interface with a 'smart' app

Prototype

Students created a pair of 3D printed glasses to simulate what a staff member might experience in using this product.

Test

Teams visited the UCHealth Innovation Center to get feedback on their initial designs and followed up with professionals regularly.

Student Designers
Abel
Anahi
Jesus
Kayla

THE OUTCOMES

At the end of the 2020-2021 school year, the four teams that had met off and on for a year and a half were finally prepared to defend their prototypes in front of UCHealth's upper echelon of innovative technology, marketing, medicine, and operations.

In the end, Team C.U.T.E. and their autonomous food delivery system came away with the highest honors from UCHealth professionals.

Below is an excerpt from the Longmont Leader, quoting Dr. Richard Zane.

Part of the mission of UCHealth is to bring young people into healthcare as well as get them to understand that this industry goes way beyond what the eyes see.

These proposals were amazing. They are very coincident with the work that we are doing at UCHealth, all four of the topical areas. For C.U.T.E., they thought about using robotics instead of humans and allowing humans to work in the adjudication and the human-to-human interaction that they are needed for. So they took a task that doesn't necessarily require a human and built a robot for it.

The Innovation Center plans to continue the project team beyond the 2020-2021 school year and into future years, adding new students to explore new solutions.

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"This project has allowed me to engage with my passion for science and medicine in a unique, **REAL-WORLD** way and gain a new perspective into these topics as I learned to empathize with the situations of both patients and medical staff. "

– Jocelyn, Senior
Team C.U.T.E.
Niwot High School

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St. Vrain Valley Schools
academic excellence by design