



# ANALYTICS.

Predictive Analytics: Harnessing Digital Information for a Current Master Plan

# PRESENTERS



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Associate  
Principal



PREDICTIVE ANALYTICS:  
**HARNESSING DIGITAL  
INFORMATION FOR**  
A CURRENT MASTER PLAN

# LEARNING OBJECTIVES

- 1. Describe** how a master planning process built on historic data can help you assess critical needs based on actual results before projects are initiated.
- 2. Review** your built environment data to determine the pertinent information that can help you make decisions about future planning and projects.
- 3. Describe** planning processes and tools that can turn raw data into powerful, predictive information for future planning.
- 4. Explain** the benefits of using computational metrics and predictive analytics in planning and design for the built environment.

**BACKGROUND**



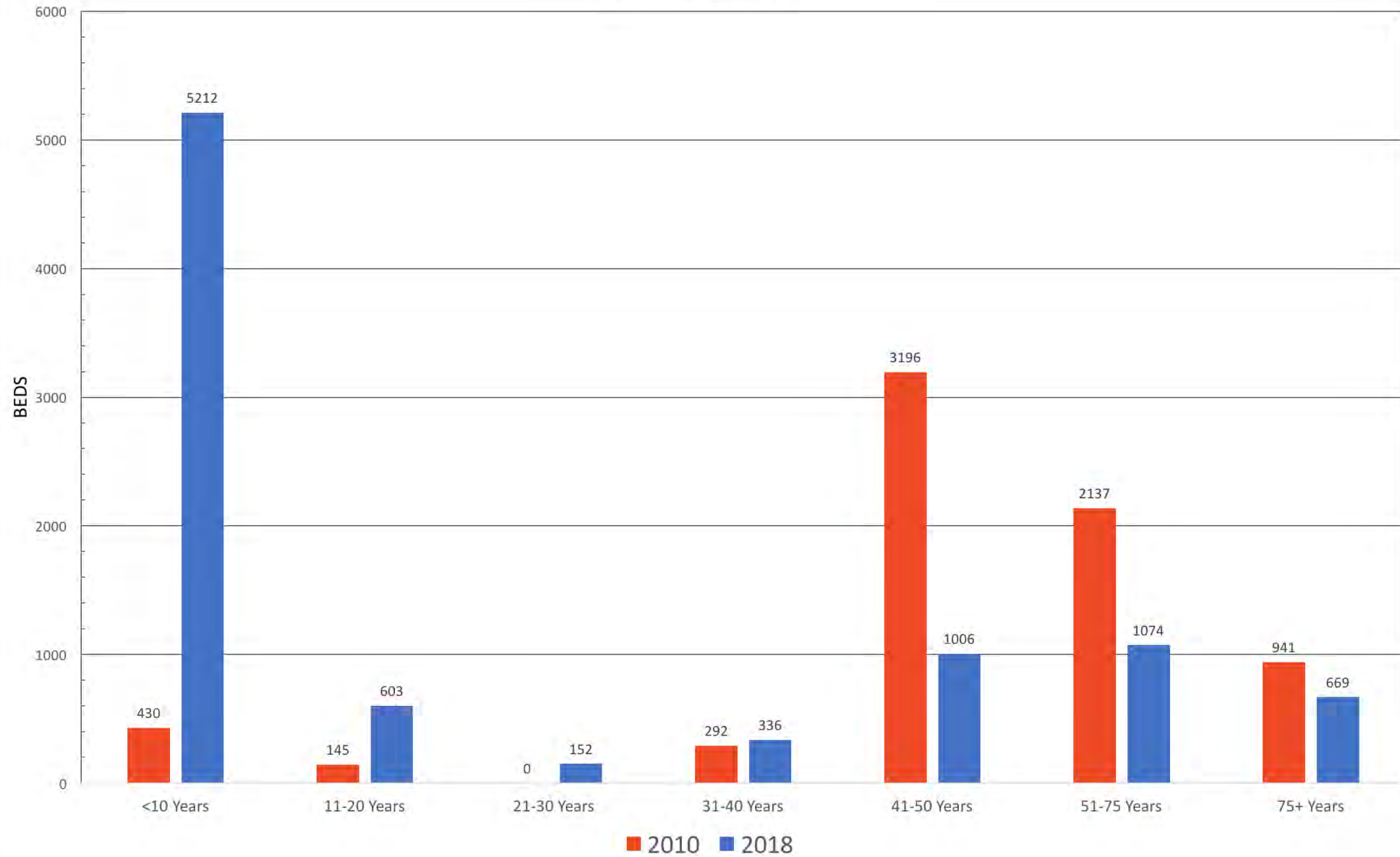
**MIAMI  
UNIVERSITY**

# Miami University Housing Master Plan

- University identified shortcomings of housing stock in 2009
- University committed investment to addressing all 41 residence halls 7100 beds: renovate, build new, decommission
- Average age of residence halls was 1955 (now 1993)



## Residence Hall Age (2010 vs. 2018)





# Miami University Housing Master Plan

## Tier 2.5 Renovation

1. Address accessibility
2. Address Envelope deferred maintenance
3. All new Mechanical, Electrical, Plumbing, Fire Suppression systems
4. More privacy in restrooms
5. Bring program areas out of basements
6. Slight de-densification of beds per hall
7. Distribute study space throughout hall





# Miami University Housing Master Plan

## Current Status

- Master Plan has been update twice formally
- New bed count target = 8600 beds
- Renovated Halls =24 (4019 beds), New Halls = 7 (1758 beds)
- Total beds affected = 5,777
- Renovations continue one per year
- Status of later stages of plan unknown

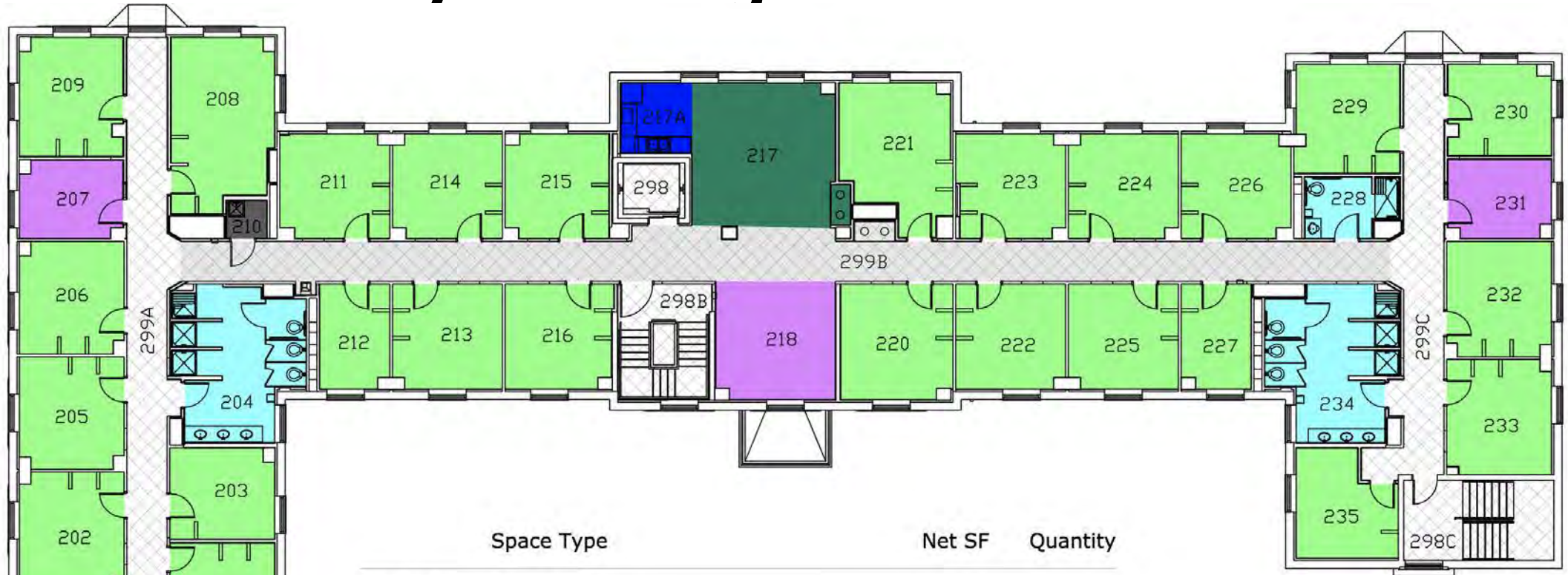


# Miami University Housing Master Plan



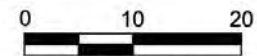
EXISTING LAYOUT

# Miami University Housing Master Plan



Space Type	Net SF	Quantity
010 Custodial	24	1
020 Circulation	2,060	7
410 Study Room	457	3
650 Lounge	325	1
910 Sleep/Study without Toilet or Bath	4,513	26
919 Toilet or Bath	611	3
935 Sleep/Study Service	78	1

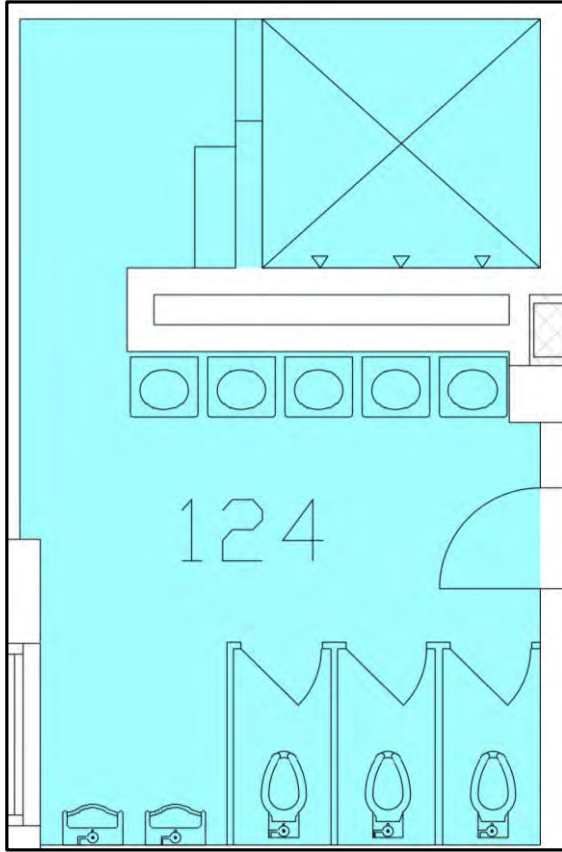
## BRANDON HALL SECOND FLOOR



SCALE IN FEET  
BRN - ID#0011

NEW LAYOUT

# Miami University Housing Master Plan



EXISTING LAYOUT



NEW LAYOUT

# Miami University Housing Master Plan

## Using Past Data

- Bedroom type ratio (maintain ratio of singles, RA ratio of 1:30, making housing attractive to upper-class students)
- Amount of collaboration/study space (more in residence halls, mix of types)
- How collaboration/study space is distributed (throughout the hall)
- Number of fixtures (ratio can be higher is more compartmentalized)
- 5% increase in bed numbers



# Miami University Housing Master Plan

## Adjustments moving forward

- Size of upper floor living rooms important
- Study rooms: group rooms not used much. Individuals study. Groups prefer open study areas
- Waterproofing
- Wireless access - can't go big enough. In every room.
- Main kitchens smaller, but more connected to other living spaces
- Fresh Air
- Standards change over time. Furniture more flexible
- As approaching newer built halls, looking to adjust approach



COLLEGE

SHAPES LIVES

**SPACE SHAPES**

**BEHAVIOUR**

# Gen-Z: life in the age of | Instagram

- **Millenials vs. Z's vs. Alphas**

- **Social Media**

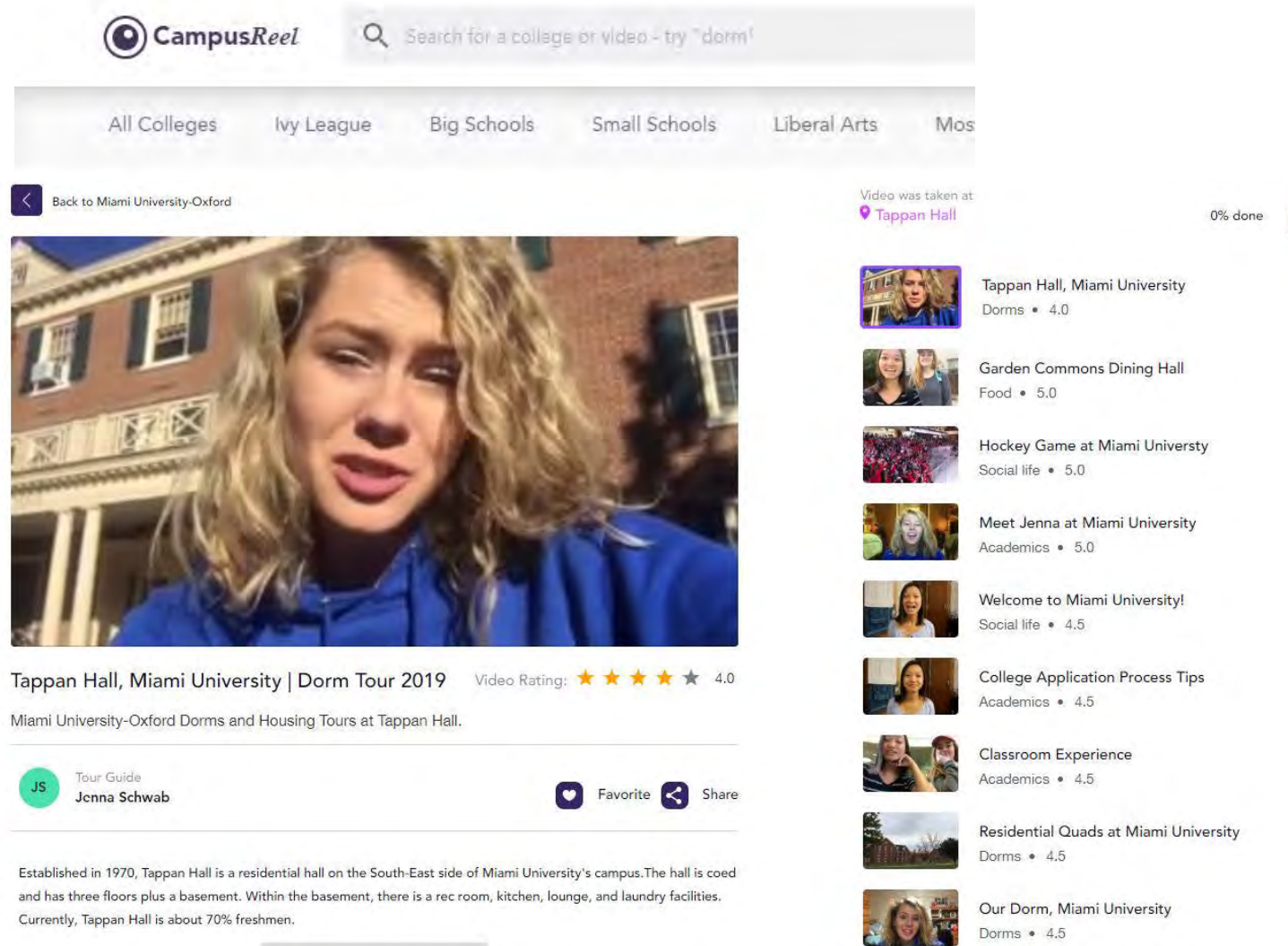
- influencers
- #nameofyourhall

- **Sharing IRL (bond/be)**

- IRL in real life
- Both public & private

- **Video (gather/be/play)**

- YouTube/ Twitch
- Gaming vs. the Big Game
- Group learning



The screenshot displays the CampusReel app interface. At the top, there is a search bar with the text "Search for a college or video - try 'dorm'". Below the search bar are navigation tabs for "All Colleges", "Ivy League", "Big Schools", "Small Schools", "Liberal Arts", and "Mos". The main content area shows a video player for "Tappan Hall, Miami University | Dorm Tour 2019" with a video rating of 4.0 stars. The video shows a young woman with blonde hair wearing a blue jacket, standing in front of a brick building. Below the video player, the user "Tour Guide Jenna Schwab" is listed with a "Favorite" button and a "Share" button. A description of Tappan Hall is provided: "Established in 1970, Tappan Hall is a residential hall on the South-East side of Miami University's campus. The hall is coed and has three floors plus a basement. Within the basement, there is a rec room, kitchen, lounge, and laundry facilities. Currently, Tappan Hall is about 70% freshmen." On the right side of the screen, there is a vertical list of recommended videos with their titles and ratings, such as "Tappan Hall, Miami University Dorms" (4.0), "Garden Commons Dining Hall Food" (5.0), "Hockey Game at Miami University Social life" (5.0), "Meet Jenna at Miami University Academics" (5.0), "Welcome to Miami University! Social life" (4.5), "College Application Process Tips Academics" (4.5), "Classroom Experience Academics" (4.5), "Residential Quads at Miami University Dorms" (4.5), and "Our Dorm, Miami University Dorms" (4.5). A "0% done" progress indicator is visible at the top right of the recommended list.

# Gen-Z: life in the age of YouTube



COLLEGE MOVE IN & DORM TOUR | Miami University |

emilyOandbows

emilyOandbows **1.2M views** 1 year ago

SUBSCRIBE To become part of the Oandbows fam! -<https://www.youtube.com/channel/UCd5W...> - Watch my last video ...



COLLEGE DORM TOUR 2019 | Miami University Sophomore Year!

emilyOandbows **11K views** 1 month ago

SUBSCRIBE To become part of the Oandbows fam! -<https://www.youtube.com/channel/UCd5W...> - Watch my last video: ...



My first college TOUR!!!

Elle Thumann  **645K views** 2 months ago

My very first college tour WHATTT Miami University is an incredible school and I would be so grateful to go there. It was such a ...



VLOG 4 - ARRIVING AT MIAMI UNIVERSITY + DORM ROOM TOUR

Project NW **25K views** 3 years ago

VLOG #4 - I've just arrived at Miami University, so let me show you around my dorm!! Make sure you subscribe to my channel if ...



Miami University Aerial Campus Tour

Miami University **100K views** 4 years ago

# Common Space



Casual or Focused



- Gaming
- Recreation
- Watch Parties
- Working Out



- Social Groups
- Chats
- Informal Meetups
- Dining



- Deeper Conversation
- Shared Work
- People Watch
- Dining



- Preparation
- Meditation
- Relaxation



# ANALYTICS - benefits

- **Pereto Principle**
  - 80-20 rule
- **Planning Efficiency**
  - Historical data
  - Pertinent information
- **Nimble**
  - Raw data to action
  - Quickly study ramifications
- **Predictive**
  - Over time more accurate
  - Student success to planning

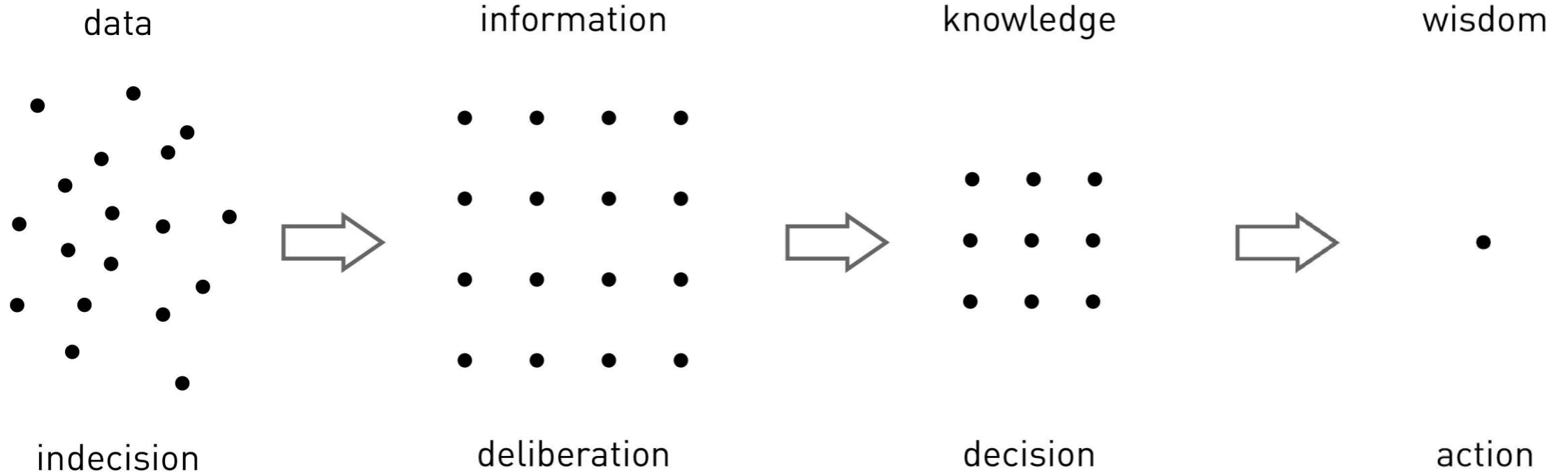
## THE CHRONICLE OF HIGHER EDUCATION We All Need to Be Data People

By Archie P. Cubarrubia | OCTOBER 13, 2019 ✓ PREMIUM



Lincoln Agnew for The Chronicle

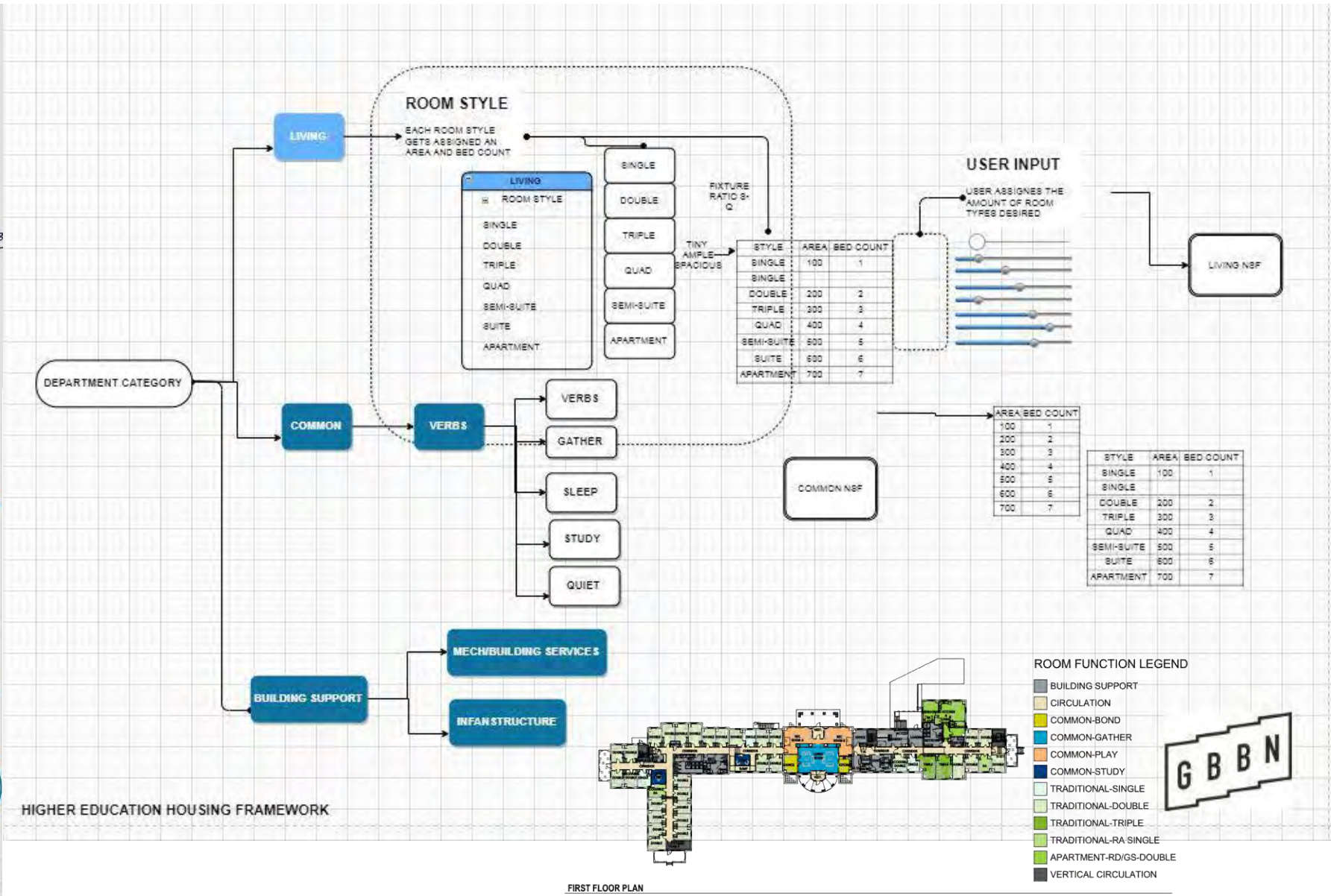
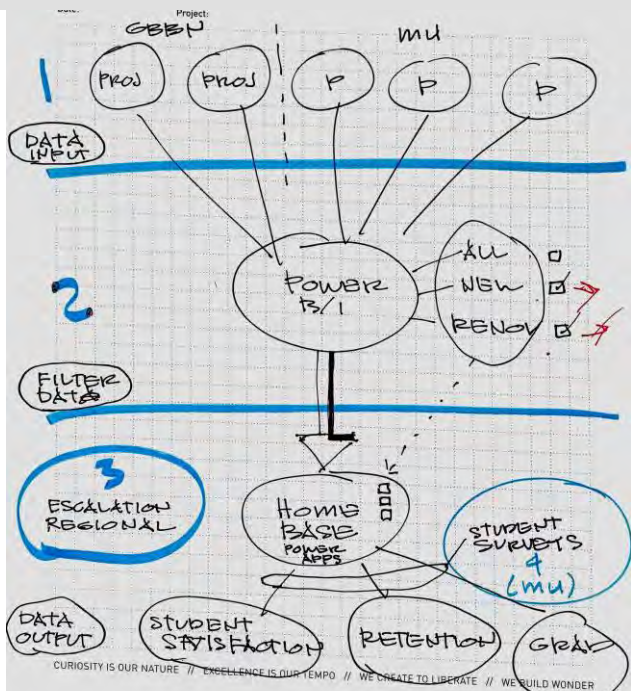
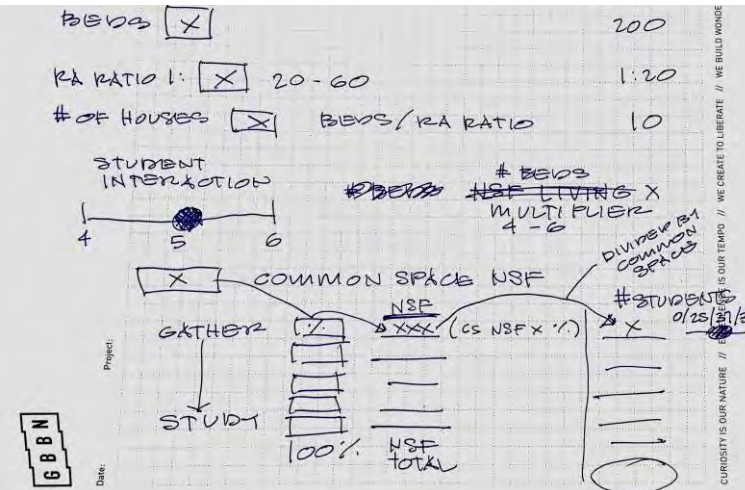
# DATA to ACTION - DIKW



# DATA / INDECISION



# INFORMATION / DELIBERATION





# KNOWLEDGE / DECISION

- Project Type: Renovation
- Owner: All
- Primary Student Level: All
- BuildingGSF: 34363, 118024
- Construction Completion - A...: All
- Construction Type: All
- Bed Count: 132, 355
- Bed Type: All

Average NSF: 21.70K

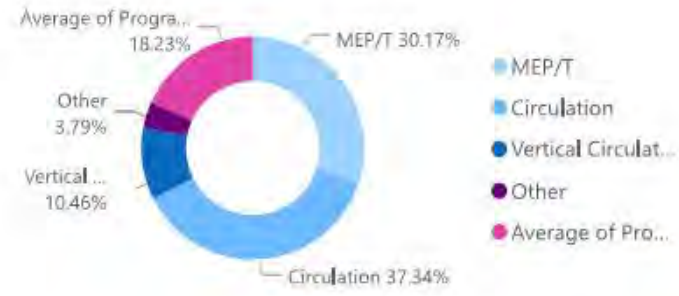
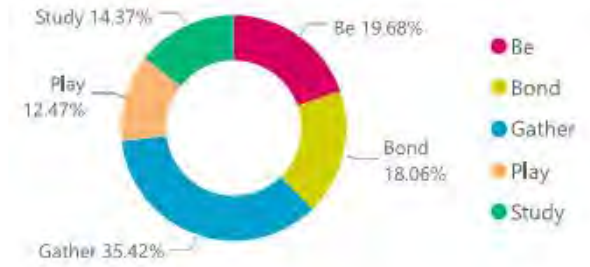
Average NSF: 4.54K

Average NSF: 28.29K

0.39

0.08

0.52



**17.00M**  
Average of Escalated Construction Cost2019

**81.57K**  
Average of \$/BED

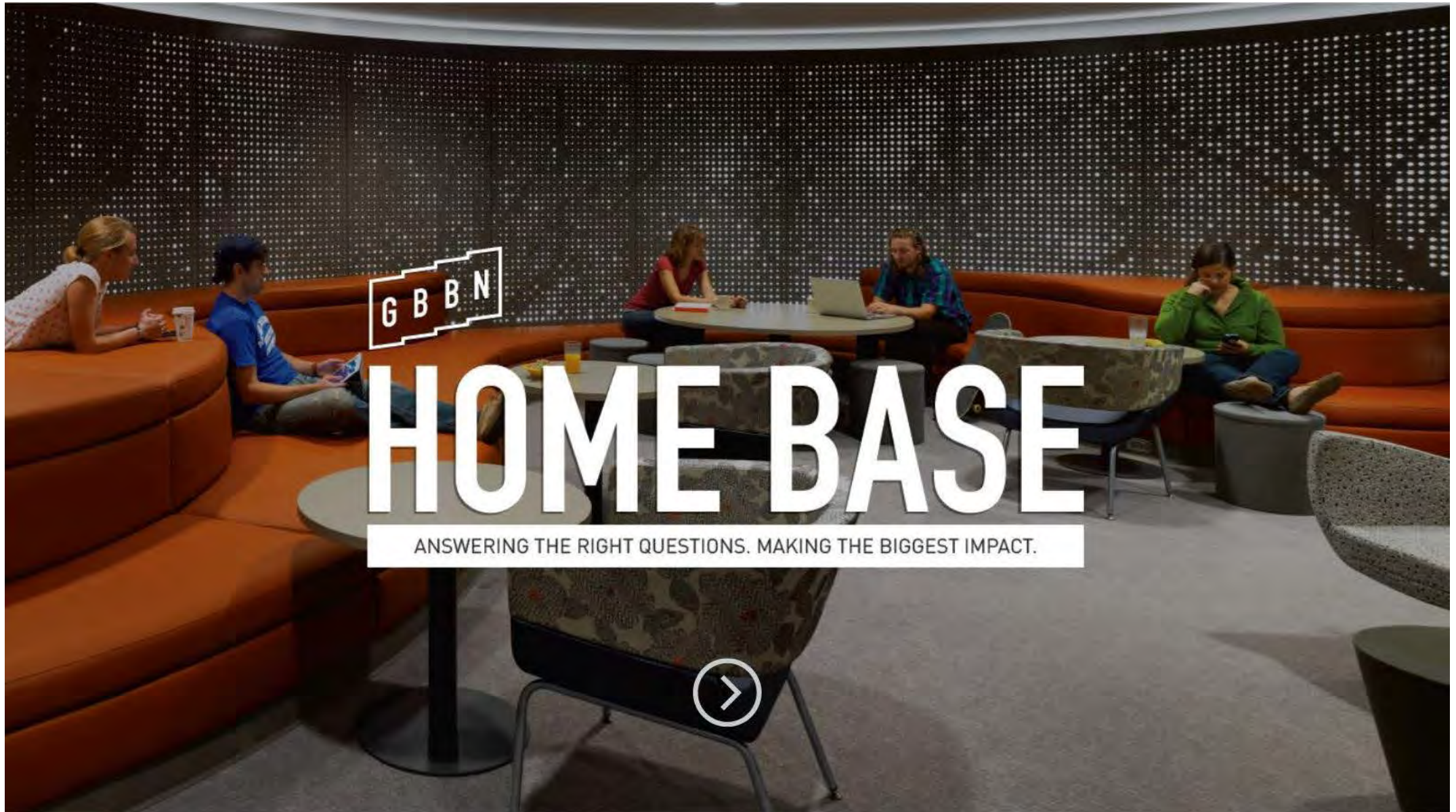
**296.50**  
Average of \$/GSF ActualEscalated

Fixture Count Average



Filtering the data through MS Power BI

# WISDOM / ACTION



GBBN

# HOME BASE

ANSWERING THE RIGHT QUESTIONS. MAKING THE BIGGEST IMPACT.



**ILLUSTRATION**

# Tappan Hall Summary

- **Built** 1970
- **Size** 71,816 gsf
- **Beds** 300 traditional beds
  - Singles 5 (1.5%)
  - Doubles 259 (86%)
  - Triples 36 (11.5%)
- **Common Space** 8,717 nsf
  - Lower level: 8,067 nsf
  - First floor: 650 nsf



# Reasons to Renovate

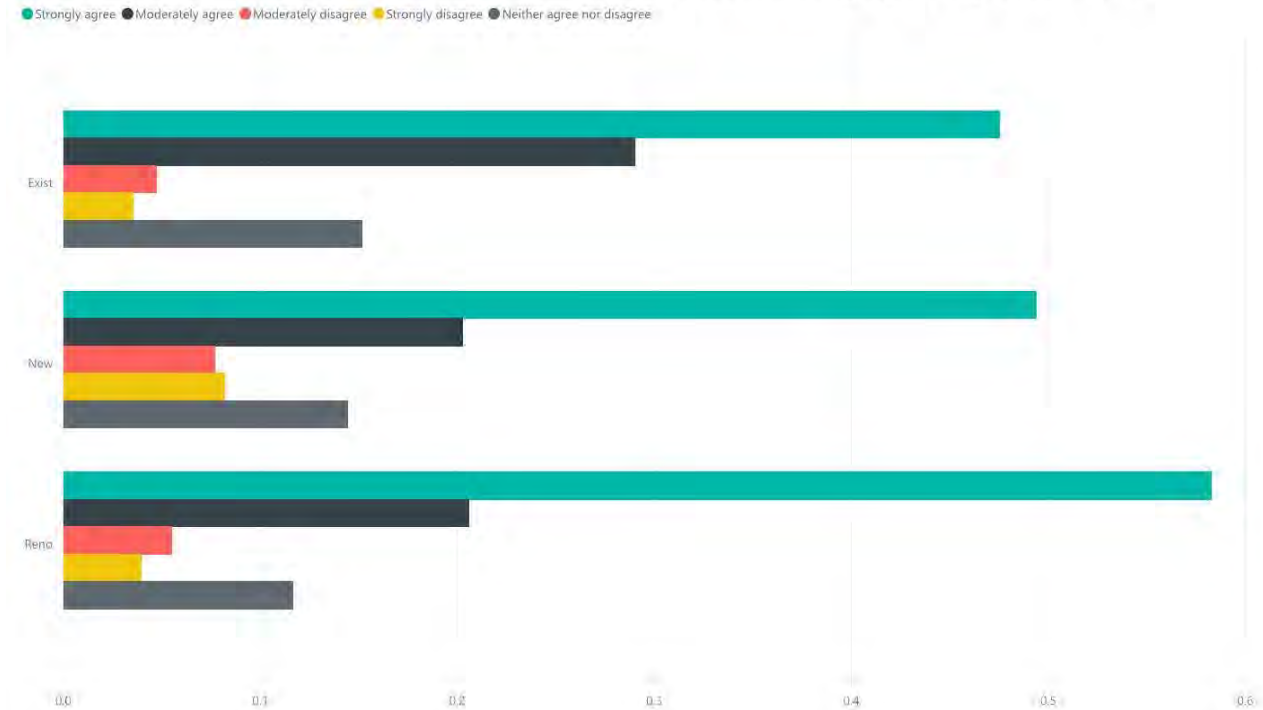
- **Accessibility**
  - Site access
  - Room access
  - No unisex/ all-gender restrooms
- **Bed breakdown**
  - 87% doubles, limited singles 1.5%
  - Accessibility
- **Mechanical upgrades**
- **Common Space**
  - Scales of space
  - Distribution on floors



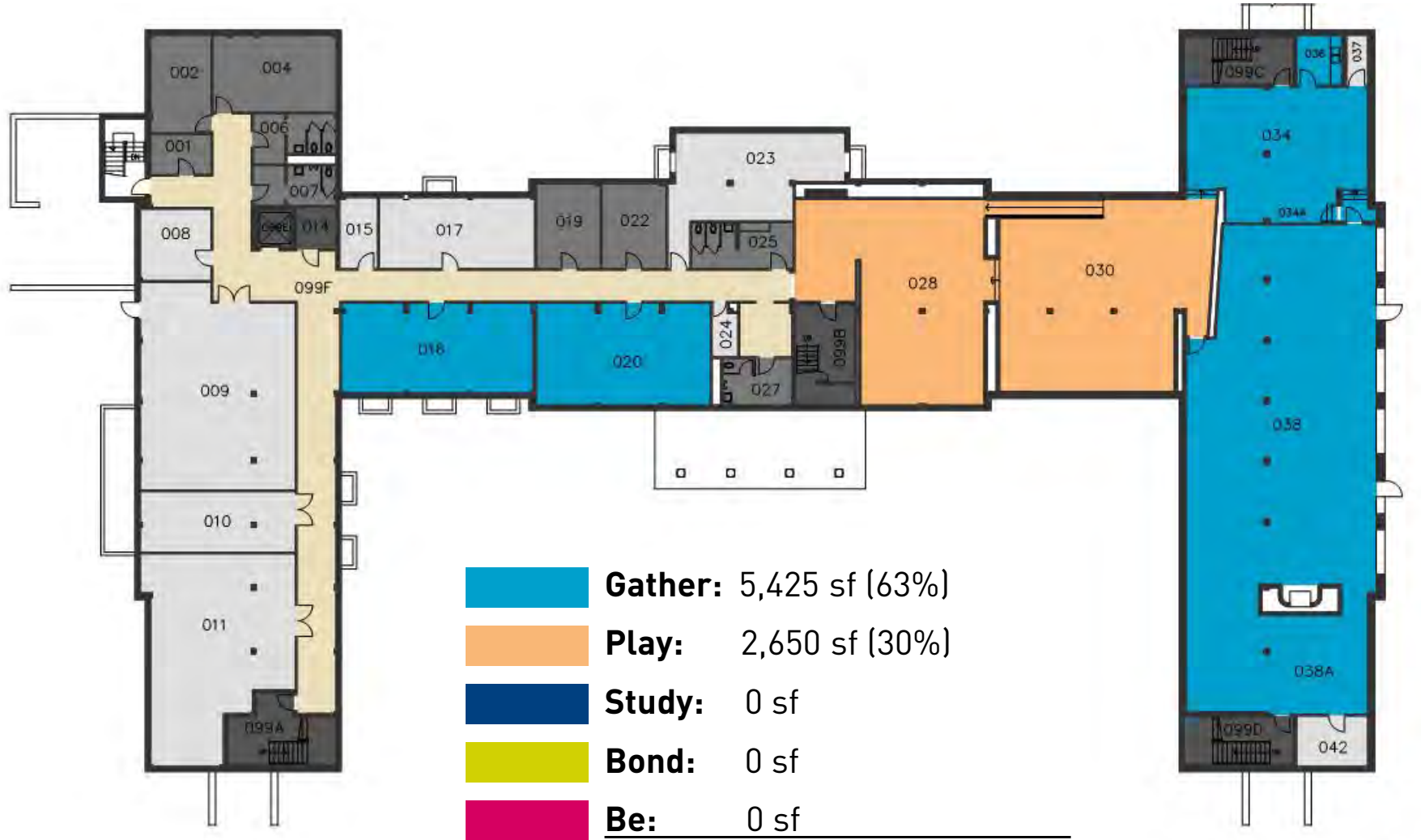
# Reasons to Renovate






- **New & Renovated Halls score higher on:**
  - Belonging
  - Community
  - Diversity/ inclusivity
  - Feels like home
- **New Halls score higher on:**
  - Security
  - Space to study
- **Renovated Halls score higher on:**
  - Satisfaction with residence life

I better understand what it means to be part of a community by living on campus

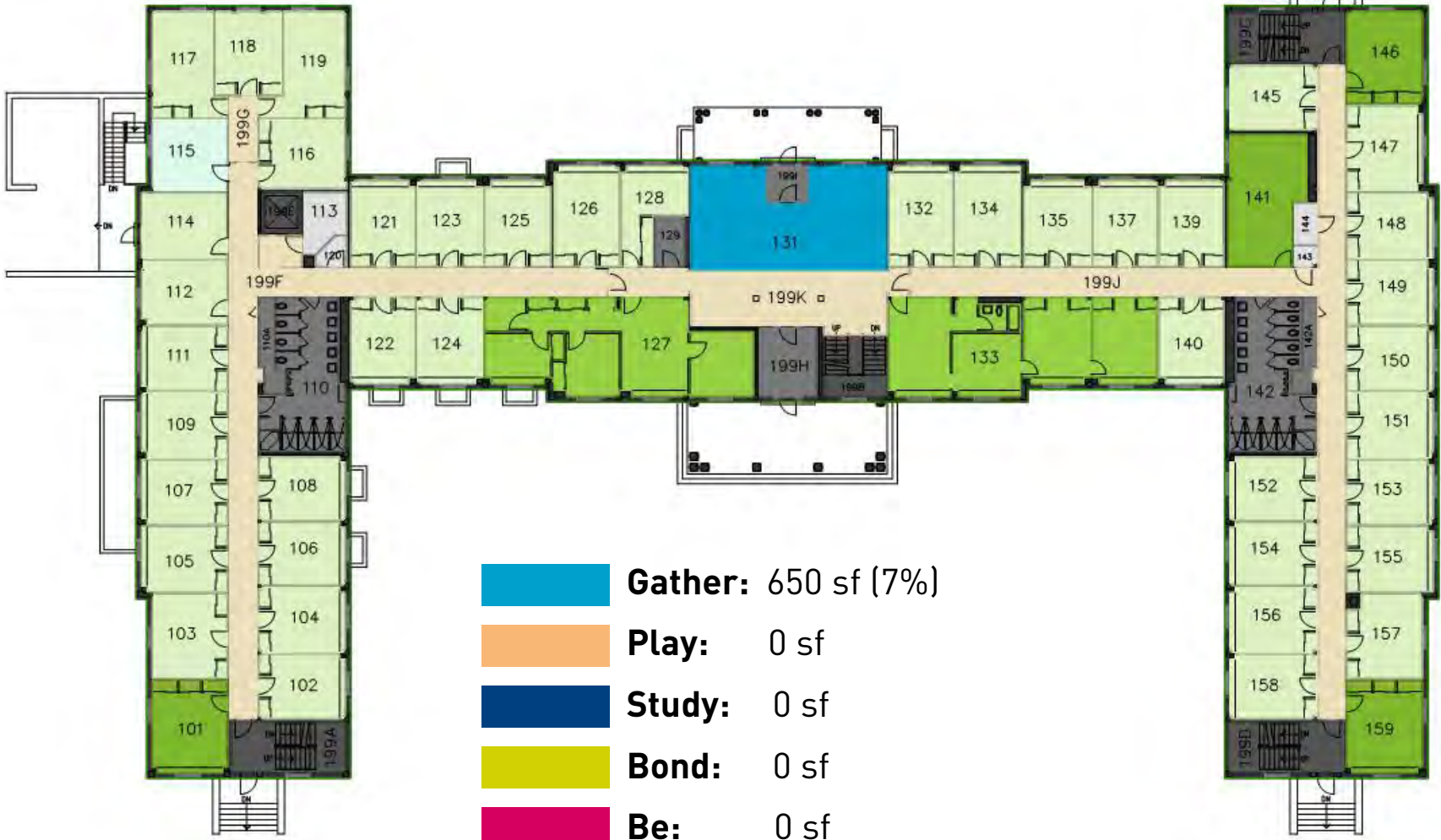


# Tappan Hall – lower level



	<b>Gather:</b> 5,425 sf (63%)
	<b>Play:</b> 2,650 sf (30%)
	<b>Study:</b> 0 sf
	<b>Bond:</b> 0 sf
	<b>Be:</b> 0 sf
<hr/>	
<b>Total:</b>	<b>8,067 sf (93%)</b>

# Tappan Hall – ground level



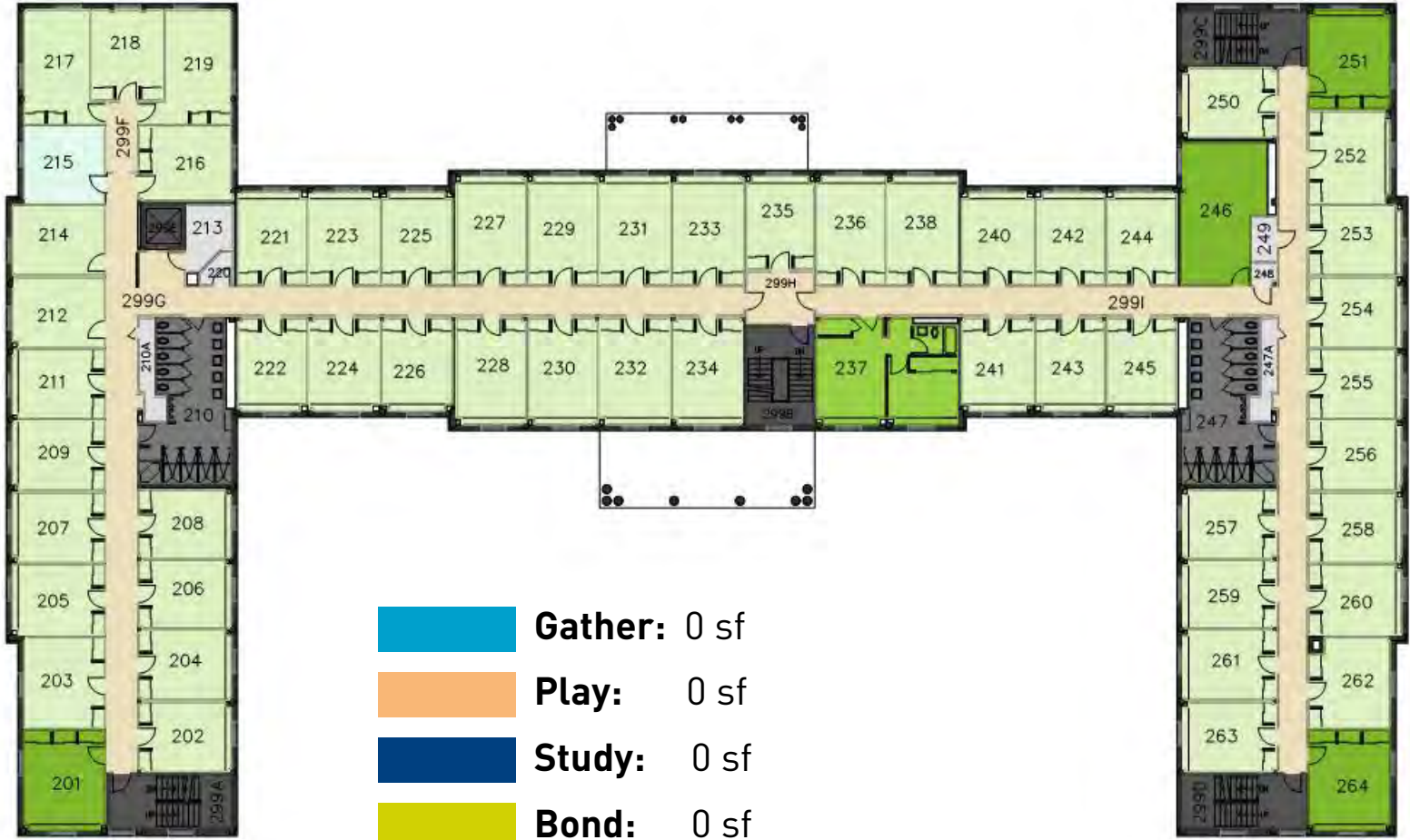
<span style="display:inline-block; width:20px; height:10px; background-color:blue;"></span>	<b>Gather:</b> 650 sf (7%)
<span style="display:inline-block; width:20px; height:10px; background-color:orange;"></span>	<b>Play:</b> 0 sf
<span style="display:inline-block; width:20px; height:10px; background-color:darkblue;"></span>	<b>Study:</b> 0 sf
<span style="display:inline-block; width:20px; height:10px; background-color:yellow;"></span>	<b>Bond:</b> 0 sf
<span style="display:inline-block; width:20px; height:10px; background-color:magenta;"></span>	<b>Be:</b> 0 sf
<hr/>	
<b>Total:</b>	<b>650 sf (7%)</b>

TAPPAN HALL  
FIRST FLOOR

SCALE IN FEET  
TAP - ID#0079



# Tappan Hall – upper levels 2&3



<span style="display:inline-block; width:15px; height:15px; background-color:blue;"></span>	<b>Gather:</b> 0 sf
<span style="display:inline-block; width:15px; height:15px; background-color:orange;"></span>	<b>Play:</b> 0 sf
<span style="display:inline-block; width:15px; height:15px; background-color:darkblue;"></span>	<b>Study:</b> 0 sf
<span style="display:inline-block; width:15px; height:15px; background-color:yellowgreen;"></span>	<b>Bond:</b> 0 sf
<span style="display:inline-block; width:15px; height:15px; background-color:magenta;"></span>	<b>Be:</b> 0 sf
<hr/>	
<b>Total:</b>	<b>0 sf (0%)</b>

**TAPPAN HALL**  
SECOND FLOOR

0 10 20  
SCALE IN FEET  
TAP - ID#0079

# Living

## HOME BASE

- HOME
- INTRO
- DASHBOARD
- LIVING
- COMMON SPACE
- BUILDING SUPPORT
- COST MODEL

**LIVING**

30,545 NSF

BEDS  
289

TRADITIONALS  
285

SEMI-SUITES  
0

SUITES  
0

APARTMENTS  
4

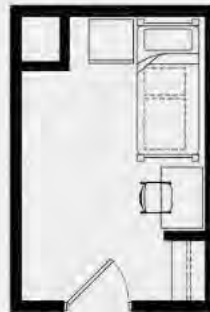
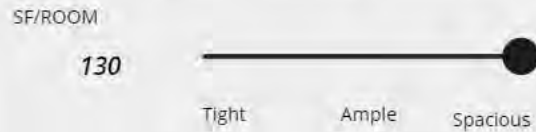
### TRADITIONALS

285

146

#### SINGLE

ROOMS	BEDS	%	AREA
16	16	5.54	2,080



#### DOUBLE

ROOMS	BEDS	%	AREA
121	242	83.74	22,990



#### TRIPLE

ROOMS	BEDS	%	AREA
9	27	9.34	2,475



### SEMI-SUITES

SEMI-SUITE SINGLE

SEMI-SUITE DOUBLE

SEMI-SUITE QUAD

AREA BEDS % AREA



# Common Space

## HOME BASE

- HOME
- INTRO
- DASHBOARD
- LIVING
- COMMON SPACE
- BUILDING SUPPORT
- COST MODEL

**COMMON SPACE**

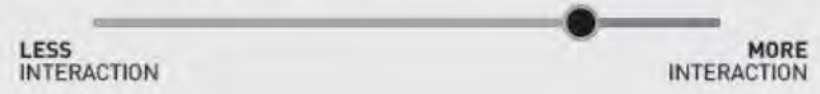
**5,780 NSF**

**STUDENT INTERACTION**

### SPACE TYPES



### INTERACTION ALLOCATION



		SF/OCC	NSF	STUDENTS
BE	<input type="text" value=".2"/>	64	1156	18.0
STUDY	<input type="text" value=".2"/>	64	1156	18.0
BOND	<input type="text" value=".2"/>	39	1156	29.6
GATHER	<input type="text" value=".2"/>	39	1156	29.6
PLAY	<input type="text" value=".2"/>	39	1156	29.6

**5780**

TOTAL STUDENTS SERVED

% OF STUDENT BODY



# Building Support

## HOME BASE

- HOME
- INTRO
- DASHBOARD
- LIVING
- COMMON SPACE
- BUILDING SUPPORT
- COST MODEL

BLDG SUPPORT

20,968 NSF

### METRICS

	SF	QTY	NSF
LOBBY	650	1	650
MAIL ROOM	150	1	150
DELIVERY	100	1	100
JANITOR (CENTRAL)	100	1	100
SGL RESTROOMS	80	3	240
RD OFFICES	150	1	150
STORAGE	300	1	300
LAUNDRY	350	1	350

	SF	QTY	NSF
STAFF BREAK RM	200	1	200
ELEVATOR LOBBY	100	3	300
JANITOR (FLOOR)	300	3	900
TRASH	300	3	900
MEDICAL RR/SH	300	1	300
STAIRS	900	3	2700
ELEVATORS	63	3	189
ELECTRICAL	500	1	500

	SF	QTY	NSF
MECHANICAL	3500	1	3500
TELECOM (CENTRAL)	500	1	500
TELECOM (FLOOR)	100	3	300
MISC	2500	2	5000

17,329

### PLUMBING FIXTURE RATIOS

		RATIO	QTY	NSF
WC	1/	7	40.	1360
LAV	1/	7	40.7	732.6
SHOWER	1/	7	40.71	1546.

3,639



# Dashboard

## HOME BASE

- HOME
- INTRO
- DASHBOARD
- LIVING
- COMMON SPACE
- BUILDING SUPPORT
- COST MODEL

SUITES		0
APARTMENTS	3,000	4
TOTAL	30,545	289
ASSIGN. NSF/BED	106	
GSF/BED	248	

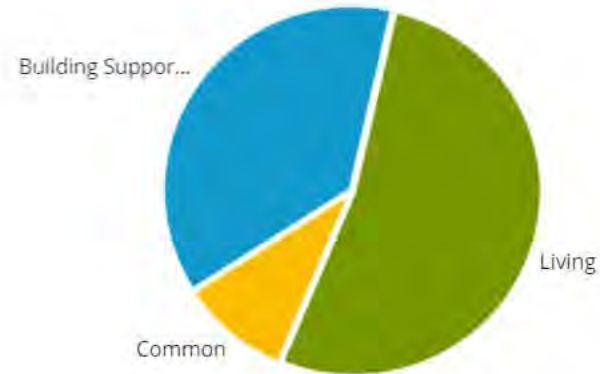
PLAY	1156
QUIET	1156
STUDY	1156

NSF STANDARD SUPPORT	17,329
NSF RESTROOM	3,639

ADD

%	GSF	
53.3	38,181	Living
10.0	7,225	Common
36.5	26,210	Building Support

**71,616** Total GSF



LIVING		30545	NET-GROSS MULTIPLIER	
CIRCULATION	x	.125	3818.12	
INFRASTRUCTURE	x	.125	3818.12	
<b>7636.25</b>				

COMMON				
CIRCULATION	x	.125	722.5	5780
INFRASTRUCTURE	x	.125	722.5	1445

BUILDING SUPPORT		5242		
CIRCULATION	x	.125		2621
INFRASTRUCTURE	x	.125		2621
<b>20,968</b>				



# Cost Summary

## HOME BASE

- HOME
- INTRO
- DASHBOARD
- LIVING
- COMMON SPACE
- BUILDING SUPPORT
- COST MODEL**

## COST MODEL

### METRICS

	GSF		\$/GSF	SUB-TOTAL	CONTINGENCY	ESCALATION	TOTAL
LIVING	38,181		\$304	\$11,607,024	\$1,160,702	\$696,421	\$13,464,147
COMMON SPACE	7,225		\$270	\$1,950,750	\$195,075	\$117,045	\$2,262,870
BLDG SUPPORT	26,210		\$250	\$6,552,500	\$655,250	\$393,150	\$7,600,900
TOTAL GSF	71,616						
\$/BED TOTAL	\$80,719						
\$/GSF TOTAL	\$326						
\$/ASSIGN. NSF	\$764						

HARD COST: **\$23,327,917**  
 SOFT COST:  **\$5,831,979**  
**TOTAL \$29,159,896**



**ADD**

# Tappan Hall

## Pre-Renovation Data

- **Living:** 34,848 nsf (300 beds)
  - Singles 5 (1.5%)
  - Doubles 278 (87%)
  - Triples 36 (11.5%)
- **Support Space:** 20,567 nsf
  - Fixture ratio ~ 1/10
- **Common Space** 8,717 nsf
  - Lower level: 8,067 nsf
  - Ground level: 650 nsf
  - Upper Levels: 0 nsf
- **TOTAL: 64,132 nsf/ 71,816 gsf**

## Post-Renovation Data

- **Living:** 30,545 nsf (285 beds)
  - Singles 16 (5%)
  - Doubles 242 (85%)
  - Triples 27 (10%)
- **Support Space:** 25,631 nsf
  - Fixture ratio ~ 1/7
  - Maker Space/ Sorority Suite
- **Common Space** 7,956 nsf
  - Lower level: 2,500 nsf
  - Ground level: 1,150 nsf
  - Upper Levels: 2,153 nsf
- **TOTAL: 64,132 nsf/ 71,816 gsf**

# AUDIENCE PARTICIPATION



# LEARNING OBJECTIVES

- 1. Describe** how a master planning process built on historic data can help you assess critical needs based on actual results before projects are initiated.
- 2. Review** your built environment data to determine the pertinent information that can help you make decisions about future planning and projects.
- 3. Describe** planning processes and tools that can turn raw data into powerful, predictive information for future planning.
- 4. Explain** the benefits of using computational metrics and predictive analytics in planning and design for the built environment.

Q&A