



**Indoor Environmental Quality + Classroom Environment
Minnesota State University, Mankato – Clinical Sciences Building (CSB)
Mankato, MN**

**June 2018, Minneapolis, MN
Sustainable Post-Occupancy Evaluation Survey (SPOES)
B3 Guidelines**

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1.0 Overview

The purpose of this report is to examine the connection between sustainable design criteria used in the design of the Minnesota State University, Mankato – Clinical Sciences Building (CSB) facility and occupants' satisfaction with their classroom environments located in this building. The Mankato CSB facility was designed using the 2009 B3 Guidelines (formerly known as the Minnesota Sustainable Building Guidelines or MSBG), which were in effect at the time that the new facility was completed for occupancy in December 2016. The B3 Guidelines track specific state-funded, B3 buildings as a means of demonstrating real outcomes aimed at the conservation of energy resources, creation and maintenance of healthy environments, and occupants' satisfaction with their environments. The Sustainable Post-Occupancy Evaluation Survey (SPOES) was developed to assess human outcomes in workplace, classroom, and residence hall settings in compliance with the B3 Guidelines project tracking requirements. This is a report of occupants' (hereafter called students) responses at 10 months post-occupancy. The survey was conducted in late-October through early-November 2017.

This SPOES report focuses on students' satisfaction with the physical environment as related to 23 indoor environmental quality (IEQ) criteria such as lighting, thermal, and acoustic conditions in their primary classrooms. Students' satisfaction with the facility (site, building, and interior) and the effect of the facility's physical environment on their perceptions of their academic performance and health also are included. Finally, a brief look at students' commuting and physical activities within the building are reported. The report provides descriptive information about students' perceptions of the IEQ of their classroom environments. In addition, this information serves the broader development of knowledge regarding the influence of IEQ on students.

2.0 Method

SPOES consists of a self-administered, Internet-based, questionnaire submitted to and completed by students. The SPOES questionnaire has been tested for **validity** (measures what it is intended to measure) and **reliability** (repeatability or replicability of findings). Students rate their level of satisfaction on a **Likert-type scale** (measurement scale) from 1 (very dissatisfied) to 7 (very satisfied) with IEQ of the facility and their primary classrooms. They also rate the influence of their physical environment on their perception of their academic performance and health on a scale from 1 (hinders) to 7 (enhances).

The report provides a descriptive summary of the results stated as a **mean** (average of all responses), **standard deviations** (SD) (how different scores are from each other and the mean), and **number of responses** (N) for each question analyzed. The mean for a 7-point scale is 4.00. Lower or higher means reflect stronger tendencies towards dissatisfaction/satisfaction and hinders/enhances. Means that are close to the center of the scale (4) are considered to be neither dissatisfied/hinders or satisfied/enhances.

When interpreting **mean** responses, the following labels were used:

- 1.00 - 3.50 dissatisfied (or hinders)
- 3.51 - 4.50 neither dissatisfied (or hinders) nor satisfied (or enhances)
- 4.51 - 7.00 satisfied (or enhances)

An IEQ Score is also calculated for students' satisfaction with IEQ in their primary classrooms. This is a statistical combination of category-level IEQ scores, which results in a single IEQ score for all respondents and is reported in an IEQ Scorecard.

2.1 Description of the Questionnaire

Students first rate their level of satisfaction with the facility (site, building, and interior) and the influence of their physical environment on their perception of their academic performance and health. Then they respond to questions about their satisfaction with their primary classrooms in relation to IEQ criteria from the B3 Guidelines. Additionally, students' physical activities and commuting practices are investigated.

In the SPOES questionnaire, the 23 IEQ criteria listed below are evaluated. There are two levels of criteria, categories and attributes. As shown in the list, the 'overall' criteria are boldfaced and called 'categories' or 'category level' criteria. A category is broader or more general such as Overall View Conditions or Overall Indoor Air Quality. Some categories have 'attributes' or 'attribute level' criteria and provide greater detail about the category. For example, Overall Thermal Conditions is a category level question, and there are four attribute level questions related to thermal conditions such as adjustability, air velocity (draft), humidity, and temperature. Overall Acoustic Conditions is a category with an attribute of students' ability to hear desired sounds. There are 11 category-level and 12 attribute level questions. Means are calculated and reported for all category and attribute-level criteria.

An IEQ Satisfaction Score is also calculated for students' satisfaction with IEQ in their primary classrooms. This is a statistical combination of the 11 category-level criteria only and results in a single, mean IEQ Satisfaction Score for students' satisfaction with the physical conditions of their primary classrooms. Attribute-level criteria are not included in the IEQ Score because unequal weight would be given to criteria that have both category and attribute-level questions.

In the following list, **category (boldface)** criteria are listed in alphabetical order. If a category has attributes, they are listed with the category.

Overall Acoustic Quality

- Ability to hear desired sounds (lecture, video, discussions, etc.)

Overall Appearance (aesthetics)

Overall Cleaning and Maintenance

Overall Daylighting Conditions

- Ability to adjust daylighting
- Amount of daylighting

Overall Electric Lighting Conditions

- Ability to adjust electric lighting
- Amount of electric lighting

Overall Furnishings

- Ability to adjust furnishings

- Function of furnishings

Overall Indoor Air Quality

Overall Technology (presentation, laptop support, etc.)

- Access to electric outlets

Overall Thermal Conditions

- Ability to adjust thermal conditions
- Air velocity (drafty/stagnant)
- Humidity (dry or moist)
- Temperature (hot or cold)

Overall Vibration and Movement

Overall View Conditions (ability to see instructor, screens, etc.)

2.2 Limitations

Students' participation is voluntary, and responses are self-reported. As is true with all survey research, the responses indicate students' perceptions. There were no physical measurements, e.g., temperature, humidity, or lighting levels of the environment taken. The classrooms are shown as a congregate measure, not analyzed individually. This study is limited to students' perceptions.

3.0 Sample Description

3.1 Description of Building

The Mankato CSB facility resides on the campus of Minnesota State University, Mankato, a part of the Minnesota State University system, and is accessible via US Highway 169. The Mankato CSB facility (see Figure 1) consists of nine (9) laboratories/studios (audiology, biomaterials, dental hygiene, dental, home health, integration stations, multi-bed, nursing simulation, and speech and hearing; most have multiple sections/spaces), seven (7) active learning classrooms (rooms 112, 212, 214, 215, 250, 315, 350, and 351), and one (1) lecture room, as well as spaces for faculty offices, common and student spaces, and other support areas. These areas are distributed across this three-floor facility (plus an unoccupied basement shell). The laboratories/studios, active learning classrooms, and lecture room comprise 21,102 square feet of an overall construction project of 80,153 square feet, 57,802 of which is currently occupied. Mankato CSB is the main classroom building for science classes. Only the overall facility, laboratories/studios, active learning classrooms, and lecture room spaces were included in this study.



Figure 1. Mankato CSB (Photo courtesy of MN State University, Mankato)

3.2 Project Team

The relevant project team members to the SPOES process for the Mankato CSB was comprised of the owner, design team, commissioning agent, and general contractor. They are identified below, relative to their capacity and involvement.

Owner	Minnesota State University, Mankato
Architect	Perkins + Will and ISG
Mechanical and Electrical Engineer	LKPB Engineers
Interior Designer	Perkins + Will

Landscape Architect	Perkins + Will
Commissioning Agent	Sebesta Blomberg
General Contractor	Shaw-Lundquist Associates, Inc.

3.3 Description of Respondents

The Mankato CSB had 1,877 students with classes in the constructed facility during the fall semester administration of the survey. The response rate to the questionnaire was approximately 13%. Of those responding, 84% were female, 14% were male, and 2% responded as ‘other.’ The mean age of respondents was 20.5 years; the range was 18 to 57 years.

Students responded that in their primary laboratory or classroom environment, 18% spend 1-2 hours per week in their primary laboratory or classroom environment, 58% spend 3-4 hours, 22% spend 5+ hours per week in their primary classroom or laboratory environment, and less than 3% spent over 40 hours per week in their primary laboratory or classroom. This indicates how much they are exposed to the classrooms’ IEQ.

4.0 Findings and Discussion

4.1 Mankato CSB Facility (Site, Building, and Interior): Overall Satisfaction, Learning Experience, and Health

Students responded to questions concerning the Mankato CSB facility (site, building, and interior) and their overall satisfaction with the facility, overall perceptions of their learning experience in relation to the facility, and their overall perception of their health in relation to the facility. Table 1 shows the means and standard deviations of their responses as well as how the responses are interpreted. Figure 2 is a graph that shows the mean for each question with a blue mark. The standard deviation is represented by a green/red, vertical bar with green representing satisfied (or enhanced) and red representing dissatisfaction (or hindered). Gray represents the ‘neither/nor’ range of responses. In cases where there were no dissatisfied responses, the bar will be all grey and green. This graph is simply a visual image of the findings from Table 1.

Table 1. Mankato CSB facility - overall satisfaction, learning experience, and health

Overall	Mean	SD	N	Interpretation
Satisfaction	6.44	0.95	241	Satisfied
Learning Experience	6.11	1.08	241	Enhanced
Health	5.71	1.22	240	Enhanced

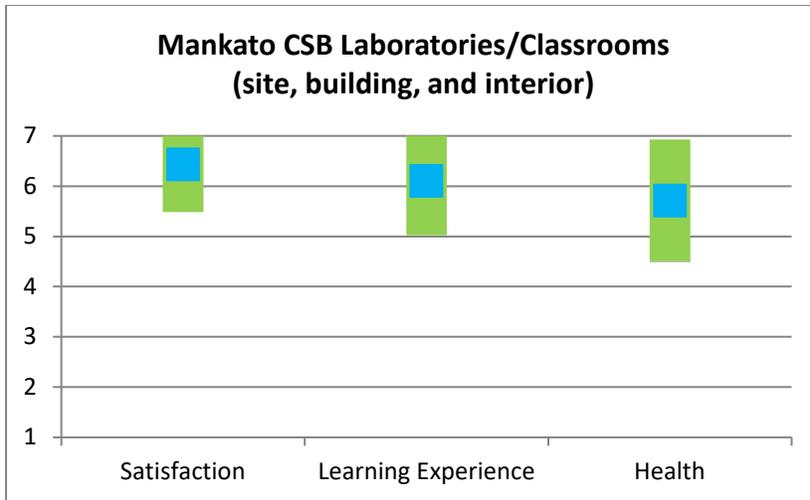


Figure 2. Mankato CSB facility - overall satisfaction, learning experience, and health

Results indicate that students were **satisfied (M = 6.44)** with the Mankato CSB facility (building, site, and interior) and reported that their overall learning experience was **enhanced (M = 6.11)** by the facility. Students reported that their overall health was **enhanced (M = 5.71)** by the facility.

4.2 Primary Classroom: Overall Satisfaction, Learning Experience, and Health

Students responded to questions concerning their overall satisfaction and overall perceptions of their learning experience and health as related to their primary classroom. Table 2 shows the means and standard deviations of their responses as well as how the responses are interpreted. Figure 3 is a visual image of the findings from Table 2.

Table 2. Mankato CSB primary classroom – overall satisfaction, learning experience, and health

Overall	Mean	SD	N	Interpretation
Satisfaction	6.28	0.98	221	Satisfied
Learning Experience	6.02	1.07	222	Enhanced
Health	5.72	1.18	221	Enhanced

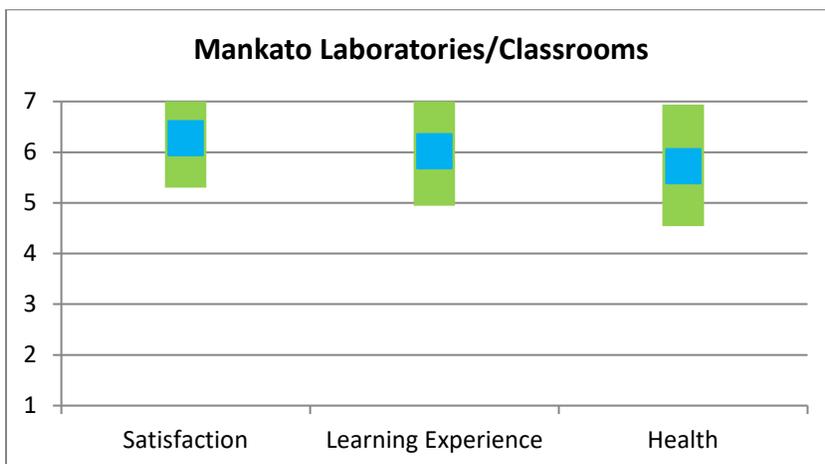


Figure 3. Mankato CSB primary classroom - overall satisfaction, learning experience, and health

Results indicate that students were **satisfied (M = 6.28)** with their primary classroom, their overall learning experience was **enhanced (M = 6.02)** by their primary classroom, and their overall health was **enhanced (M = 5.72)** by their primary classroom.

4.3 Primary Classroom: Satisfaction with Indoor Environmental Quality (IEQ)

Students responded to questions concerning their satisfaction with IEQ criteria (thermal conditions, indoor air quality, acoustic conditions, etc.) related to their primary classroom. Table 3 shows the means and standard deviations of their responses in order from highest to lowest mean, as well as how the responses are interpreted. It must be noted that all responses, regardless of the classroom, were combined so these are composite means of all classrooms in Mankato CSB. Figure 4 is a visual image of the findings in Table 3.

Table 3. Mankato CSB primary classroom - satisfaction with IEQ criteria

#	IEQ Criteria (1-23) (Category level criteria are bold face)	Mean	SD	N	Interpretation (D = Dissatisfied) (S = Satisfied)
1	Overall cleaning and maintenance	6.47	0.93	221	Satisfied
2	Overall daylighting	6.42	0.92	223	Satisfied
3	Amount of daylighting	6.41	0.92	222	Satisfied
4	Overall appearance (aesthetics)	6.40	1.06	222	Satisfied
5	Amount of electric light	6.30	0.96	223	Satisfied
6	Overall indoor air quality	6.29	1.04	223	Satisfied
7	Overall electric lighting conditions	6.29	1.01	223	Satisfied
8	Adjustability of daylighting	6.23	1.10	222	Satisfied
9	Overall acoustic quality	6.19	1.07	222	Satisfied
10	Ability to adjust electric lighting	6.18	1.16	222	Satisfied
11	Overall view conditions	6.16	1.24	223	Satisfied
12	Overall furnishings	6.13	1.36	223	Satisfied
13	Function of furnishings	6.13	1.29	223	Satisfied
14	Ability to hear desired sounds	6.10	1.28	223	Satisfied
15	Overall vibration and movement	6.08	1.15	221	Satisfied
16	Overall technology conditions	6.05	1.34	222	Satisfied
17	Adjustability of furnishings	6.02	1.40	222	Satisfied
18	Humidity (dry or moist)	6.00	1.19	222	Satisfied
19	Air velocity (drafty or stagnant)	5.95	1.30	222	Satisfied
20	Overall thermal conditions	5.85	1.31	223	Satisfied
21	Access to electric outlets	5.82	1.60	222	Satisfied
22	Temperature (hot or cold)	5.65	1.43	223	Satisfied
23	Adjustability of thermal conditions	5.62	1.41	218	Satisfied

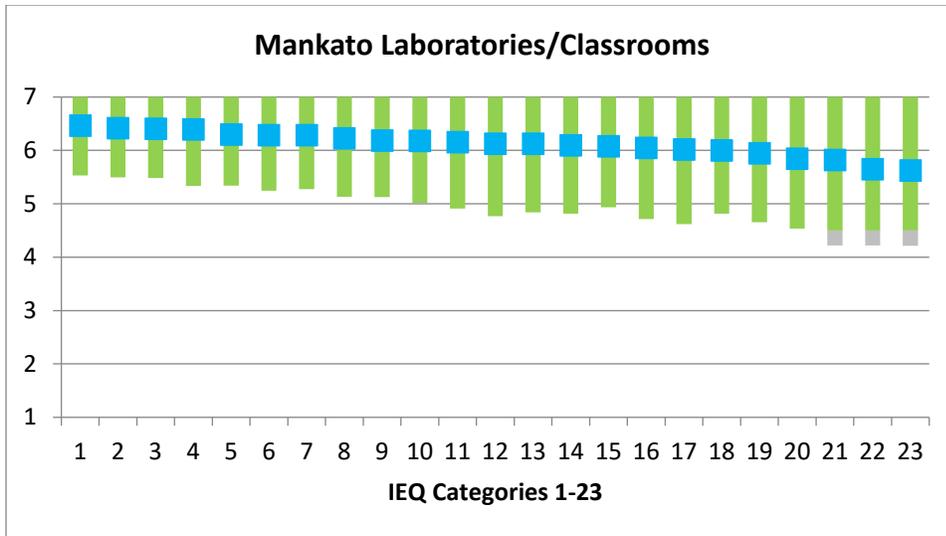


Figure 4. Mankato CSB primary classroom - satisfaction with IEQ criteria (IEQ 1-23 are listed in Table 3)

Results indicate that students were **satisfied** with all of the IEQ criteria in their primary classrooms. Means ranged from **6.47** (Overall cleaning and maintenance) to **5.62** (adjustability of thermal conditions). These findings support a **consistently positive level of student satisfaction** with the IEQ of their laboratories and classrooms. Further information about their perceptions can be found in Appendix A. Open-Ended Responses.

4.4 IEQ Satisfaction Scorecard

The IEQ Satisfaction Score is determined by calculating a mean of all 11 category level IEQ criteria. At this time, all criteria are weighted equally in this calculation as little evidence exists that provides rationale for weighting some criteria heavier than others. The IEQ mean is representative of a relatively high overall IEQ score and can serve as a benchmark of students' satisfaction with the physical environment of their primary classroom. As shown in Figure 5, the **IEQ Satisfaction Score** for Mankato CSB is **6.21**, which falls at the high end of the satisfied range. The large number of criteria with scores above the mean contribute to this high IEQ Score.



Figure 5. Mankato CSB primary Classroom - IEQ Satisfaction Score

Overall, the students showed a positive satisfaction level with the IEQ of Mankato CSB laboratories and classrooms as indicated by the mean score of **6.21**. As shown in Table 3, all IEQ categories were at or above **5.85**; eight (8) categories were at or above **6.13** and helped to increase the IEQ Score. Please note that the IEQ Satisfaction Score only uses the category level criteria (those labeled 'Overall'; see section 2.1, paragraph 3 for explanation). This IEQ score sets a positive benchmark for continued assessment of students' satisfaction.

5.0 Physical Activity Engagement and Commuting Practices

In the final section of the survey, students responded to questions regarding their overall physical activity while at Mankato CSB (site, building, and interior) and their commuting practices.

5.1 Physical Activity Engagement

Providing students with opportunities for alternative paths of travel around the classroom building, e.g., taking stairs as opposed to the elevator, provides opportunities to engage in additional types of physical activities. Engaging in physical travel throughout the learning environment can be associated with healthier lifestyles.

Table 4. Overall physical activity (walking, stair use, etc.) affected by the MANKATO CSB facility

Mankato CSB Facility (Site, Building, and Interior)	Mean	SD	N	Interpretation
Overall physical activity (walking, stair use, etc.)	6.10	1.08	221	Enhanced

Results indicate that students felt that Mankato CSB **enhanced (M = 6.10)** their physical activities (walking, stair use, etc.).

5.2 Commuting Practices

The Mankato CSB facility resides on the campus of Minnesota State University, Mankato, and is accessible via US Highway 169. The CSB is located at 150 South Road to the south and Warren Street to the east. The CSB is located on the eastern edge of the campus and is across South Road from the Taylor Center. The University provides parking locations throughout the campus in various permitted and free surface lots. Public transportation via the campus bus is available and bicycle riding is encouraged and supported.

Table 5 provides results on students' primary mode of transportation; Table 6 summarizes commuting distances between home and the Mankato CSB facility; and Table 7 summarizes students' ability to commute using alternative choices (walk, public transit, bike, van, or carpool, etc.). These results, although not related to IEQ, do offer the University insight into students' commuting behaviors and opinions. These data can provide important information about commuting practices that can reduce transportation energy consumption.

Table 5. Commuting practices – Mankato CSB primary mode of transportation

Commuting Practices Home to Mankato CSB (N=222)	Walk	Drive alone (or with children <16)	Public Transit	Carpool or Vanpool	Bicycle	Motorcycle or Moped	Other
Students commuting mode (%)	60%	21%	10%	6%	<2%	<1%	>1%

Related to primary modes of transportation, 60% walk, 21% of students drive alone (or with children under 16), 10% utilize public transportation, 6% participate in a carpool or vanpool, less than 2% bike, less than 1% ride a motorcycle or moped, and less than 1% travel by other means not identified.

Table 6. Commuting practices – Mankato CSB commuting distance traveled

Miles Traveled One Way (N=222)	0-5	6-15	16-30	31-45	46-75	>76
Students commuting distance (%)	85%	7%	3%	3%	>1%	<1%

Results indicate that 85% of students commute 0-5 miles one-way between home and Mankato CSB, followed by 7% who commute 6-15 miles, 3% commute 16-30 miles, 3% commute 31-45 miles, more than 1% commute 46-75 miles, and less than 1% commute 76 miles or more to Mankato CSB. All commuting mileage is reported as one-way miles. Note that the overall percentage may not total 100% due to rounding.

Table 7. Commuting practices – Mankato CSB location and alternative commuting behaviors

Mankato CSB Facility (Site, Building, Interior)	Mean	SD	N
Ability to commute in alternative ways	5.45	1.45	221

Results indicate that the location of the Mankato CSB **enhanced (M = 5.45)** students’ ability to commute to class in alternative ways, e.g., walk, bicycle, public transit, van or carpool, etc.

6.0 Conclusions

6.1 Summary

A post-occupancy evaluation was conducted of students of Mankato CSB at approximately 10 months after its construction in 2016. About 13% of the students who are enrolled in classes in Mankato CSB responded to the survey.

The survey included questions related to students’ overall satisfaction with the facility (site, building, and interior) and influence of the facility on their overall learning experience and health. Students were **satisfied** with the facility (**M = 6.44**); they found the facility **enhanced** their overall learning experience (**M = 6.11**) and **enhanced** their overall health (**M = 5.71**). When students were asked these same questions about their primary laboratory or classroom, they reported overall **satisfaction (M = 6.28)** with their primary laboratories or classrooms. They also reported that their overall learning experience was **enhanced (M = 6.02)** by their primary classrooms, and their overall health was **enhanced (M = 5.72)** by their primary classroom. As the range of scores was from 1-7, these scores indicate satisfaction is moderately high.

Most of the survey questions related to students’ satisfaction with the IEQ criteria in their primary laboratories or classrooms. Students’ responses showed they were **satisfied** with all 23 of the IEQ criteria. The scores ranged from **5.62** (adjustability of thermal conditions) to **6.47** (Overall cleaning and maintenance). This is high level of satisfaction and the consistently positive satisfaction scores are admirable.

From the students’ responses, an IEQ Score was developed and shows their **satisfaction** with the IEQ of all category level criteria. For Mankato CSB, the IEQ Satisfaction Score was **6.21**. This score reflects a **high satisfaction** level with IEQ categories. Finally, students reported that Mankato CSB **enhanced (6.10)** their physical activity, which is one of the sustainable design criteria that influences occupant behavior.

6.2 Recommendations

The satisfaction scores are certainly in the positive direction, however, it is important to continuously work on IEQ criteria before there is dissatisfaction. For example, for IEQ categories that have physical measurement possible, e.g., thermal, acoustic, and lighting, it is recommended that these measurements be taken in classrooms. Other recommendations follow that could help the University keep occupants' satisfaction positive.

Acoustic Conditions

- Identify acoustic criteria for overall requirements.
- Determine if any task areas differ now from their original spatial layout/use (e.g., classrooms adjacent to noisy spaces).
- Develop specialized acoustical performance requirements to support functional programming occupants' tasks (e.g., sources of recurrent noise that need to be controlled, special user populations that may have distinct auditory performance limitations, or multiple uses of building spaces that may have different acoustic criteria). Identify and apply appropriate acoustics modeling software for the project.
- Measure acoustic performance onsite with full building systems (heating, ventilation, and air conditioning) running.
- Identify occupants' privacy concerns via focus groups and/or log complaints relative to acoustical conditions for further evaluation.
- Consider occupants' tasks within shared spaces to determine if spatial layout changes can be made for increased acoustic control.

Lighting Conditions

- Identify occupants' lighting performance criteria that are to be met to achieve goals by conducting onsite measurements of existing illumination and compare them to standards for occupants' tasks as identified by the Illuminating Engineering Society (IES).
- Determine if any task areas differ now from original intent to be sure illumination level and quality of lighting are not impeded by physical changes to the space (i.e., walls, ceilings, furnishings, fixtures, or equipment).
- Develop additional quality lighting criteria as needed for special facility (e.g., influence of daylight quality or quantity) or occupant (e.g., age, task duration) issues.
- Log complaints related to lighting conditions for further evaluation.
- Identify poor lighting conditions caused by a lack of control over daylighting, which can cause glare and eyestrain.

Personal Adjustability

- Determine if adjustability issues arise with temperature, lighting, or furnishings via a focus group.
- Identify personal, individual problem areas and relate them to other IEQ issues via a log of complaints relative to adjustability.
- Provide education to occupants about any existing/achievable adjustment options, e.g., furnishings, air diffusers, lighting, temperature control, etc.

Privacy Conditions

- Identify occupants' privacy concerns via focus groups or log complaints relative to privacy to determine if visual or audio privacy is most affected.

- Determine if any task areas or responsibilities differ from original intent and develop alternatives or modifications.
- Consider adding noise masking equipment and/or visual screening depending on the nature of the complaints.
- Document and compare acoustic privacy problem areas with acoustic measurements to pinpoint specific problem areas.

Thermal Conditions

- Measure thermal performance conditions on site.
- Log complaints related to thermal conditions for further evaluation.
- Determine special thermal comfort requirements or problems that may be encountered in the building due to physicality of work activities, duration of sitting, or design/layout considerations. Focus groups can be useful in identifying problem locations.
- Determine if any occupants' task areas differ now from original layout to determine if air flow is meeting systems design intent.
- Review conditions that affect thermal comfort using ASHRAE Standard 55-2004 or Human Factors Design Handbook (see B3 Guidelines).

This study investigated students' satisfaction with the Mankato CSB facility and primary laboratories and classrooms. IEQ satisfaction is individual, but the results of the survey show a central tendency to high satisfaction with the facility and IEQ criteria. The results can be used as a diagnostic tool to aid in continuously improving IEQ conditions for students and to set the benchmarks from which improvement can be measured in the future.

Appendix A. Open-Ended Responses

Students had the opportunity to raise specific concerns on the overall facility and their primary classrooms. Important information can be gleaned from the numerous, open-ended survey responses. Mankato CSB students raised a wide variety of concerns in addition to many positive comments. Concerns raised related to appearance (aesthetics) and amenities; electric lighting, daylighting, and view conditions, furnishings, spatial layout, technology, and thermal conditions. Generally, the comments are shown exactly as written.

Overall Positive/Negative

- Excellent facility.
- Everything is new and very accessible.
- Thanks
- I love the CSB!
- I think the new CSB is awesome!
- It's a great building to have class in
- Environmental sustainability is very important to me and other students.
- I enjoy the way the main areas are designed and what furnishings are present, it enhances my ability to study, especially when referring to the study pods, large white boards, and the integration station/study rooms.
- Love this building!
- I love the classroom in the clinical sciences building.
- The speech lab is incredible and I think really enhances our program.
- I think this is a very nice facility to have classes.
- It's a beautiful building and makes me more excited to go to school!
- I absolutely love my class is the CSB! It makes my 8 am easier to go to because of how the classroom looks and how engaged in my class I can be.
- I love this building. I spend almost all of my time on campus throughout this building and I am so pleased with everything that this building has to offer.
- The CSB provides, study areas, group areas, printers, microwave, and also just a place to hang out. I love the environment!
- Echoing sounds throughout the entire building.
- The building is beautiful, but the space could have been put to better use.
- It is overall a very nice facility to have on campus.
- When I first arrived on campus, I thought the building was very eye-catching, and I think it resembles the cliff alcoves where Anasazi people chose to build their dwellings. The building has a very earthy, grounded feel to it while at the same time being 100% up-to-date with technology.
- The location might be a little hard in the winter because it is far from the residence halls on campus
- Put the name of the building on the boards around campus at MNSU. Do it. Please just do it.
- Put the sign for the CSB on the boards. Every building is labeled with arrows but the CSB isn't. I got lost and missed most of class. It pissed me off.
- Include holiday decorations during the season.

Appearance (Aesthetics) and Amenities

- Building/classrooms seem empty/blank.
- It would look more finished if there was stuff up on the walls throughout the building.
- I would prefer to have different flooring in the hallways (instead of the grey concrete) The tables in the speech therapy rooms probably shouldn't be white because they get dirty very easily. I'd like to see more color and less white in general around the building.
- There are planks that hang down from the front of the tables and I'm not sure what their purpose is they just seem like something to bump knees into when moving around.
- It feels empty and plain.
- We would like some sort of coffee stand with snack options.

Electric Lighting, Daylighting, and View

- The only complaint that I have with our classroom (CSB 212) is that the lighting is hard to control. the sensors seem to override the controls which I would classify as a design flaw. If I had to guess the amount of daylight affects the sensors and dims the indoor lighting. It can be slightly frustrating when the lights all of a sudden dim, so you turn them back up, and they dim again.
- [Classrooms] are very versatile and I love the lighting.
- I love the view and amount of windows.
- I really like the big windows in the hallway, they let in a lot of sunlight.
- I also like that the daylighting is in the stair area that is accessible to all (not any one classroom). I do note that the lights in my classroom seem to have a "mind of their own" and dim and get brighter at random with no apparent stimulus.
- Turn off lights and use more natural light.

Furnishings

- I'm super excited about the chairs/desks that are in room 351. They are awesome and super easy to use and manipulate to better fit the style of learning that gen professor uses each class period. Love them.
- The swivel chairs with the adjustable desk top are very uncomfortable and they are hard to move around because the room is so cramped
- The tables are too long and too close together. There could be a split in the middle of them to allow for more students to leave at one time. I have found myself awkwardly in another student's way often this semester since they do not bring much to class and I do so packing up takes me a little longer.
- I like the study areas, with a combination of comfy lounge chairs and office-like work space.
- The three individual study carrels are often full when I want to sit at one.
- The desk chair things are ok, but they make the space feel very cluttered and no one moves their chair back if we have to move it, and it's hard to sit in them and find a good place for your backpack. The chairs are really annoying.
- The desks are uncomfortable.
- I enjoy the classrooms overall but I find the chairs uncomfortable as they are made out of plastic. They also do not move as much as I wish they did, the chair/table combination is not extremely useful.

- I am not a fan of the spinning desk chairs in some of the rooms; they are difficult to sit in because they move around too much (not very practical for lecture-based courses) and somewhat uncomfortable.
- The furniture is really nice and the study areas are enjoyable, both in comfort and aesthetic. I wish other buildings had a similar layout for study areas/sitting options

Spatial Layout

- If you are sitting in the back in a lecture room you cannot see the bottom half of the presentation screen
- I wish the lecture halls had steeper tiers because it can be difficult to see the screens over other students at times. Also, the lecture halls and classrooms are often overcrowded and there is little room to move or work.
- Honestly, I think there is way too much empty space where other class rooms could have gone.
- I wish each row was a little higher because sitting in the back rows makes it difficult to read the bottom of the board.
- I am in a full class, and it is a little hard to move around. Sometimes I feel as if there isn't enough room in my seat, front and back. Mostly just when I am trying to get to my backpack, or when I am trying to get to my seat in the middle of the row. It is not a huge problem.
- Seems like a lot of chairs to squish together
- It's difficult to store backpacks while taking a large class. There's no room at all for storage unless you sit on one of the seats at the end.
- It would be nice if there were a wider landing between the flights of steps between the second and third levels. It is literally two strides of flat before going up steps again and isn't enough to let you catch your breath.
- Like I said before, the CSB is a lovely building but the space could have been utilized more effectively for class space.

Technology

- A few computers to go with the printer would be nice.
- Printer only prints one-sided, not double-sided.
- New printing spot. More charging ports.
- In CSB 351 I do not like the way the presentation screens are laid out (podium is on front of one which makes it hard to read PowerPoints during lecture and presentations) and the microphone being on (professors have been unaware if there is an ability to turn it off).
- Our professor has issues with the sound system every time he tries to show a movie. The simulation space is great and really enhances learning.
- I would be nice if we had tech support in this building since it is brand new and our night class is always having technical difficulties.
- The technology is extremely touchy.
- I sit in the front of the classroom and can hear my professor but often I can't hear other students during discussion. I'm not sure this is necessarily because of acoustics I think they are probably just speaking too softly.
- In class on Tuesday night, one screen wouldn't work or turn on and the other screen was green but the PowerPoint was white.
- The technology systems in the classrooms never works!

- Instructors have had numerous problems with the sounds system not working. Also, it is usually extremely cold which affects our learning capabilities. Many classrooms do not have outlets available which makes it hard for students to stay engaged when their laptops die.
- We have had issues in all of our classes in this building with the speakers. None of our teachers can get the sound to work without putting the microphone up the computer. This has compromised hours of class time on multiple occasions, trying to figure it out to watch videos or listen to heart/lung sounds.
- There needs to be outlets on the second and third floor classrooms. I believe there are only a couple throughout the whole room. I would recommend built-in outlets in the tables like they have on floor 1.
- The only outlets available in many of the rooms are either a few on the very side of the class or all the way in the back. With hearing or visual deficits this is a problem because you cannot be close enough to the speaker. There should be outlets on the floor or incorporated into the tables for better accessibility. Many rooms have very few outlets with very many students.
- There are not enough outlets for students when sitting in the desks.
- The outlets in the tables do not work.
- There isn't good access to outlets in order to use laptops during class.
- More outlets in classrooms
- No clocks in classrooms

Thermal Conditions

- Always freezing!
- It gets really hot in the building.
- Sometimes the classrooms on the second and third floors can be cold.
- The classrooms are always cold.
- CSB 351 is often cold but we just learned today that we can adjust the thermostat so that should help!
- CSB 351 is always absolutely freezing!
- Sometimes the temperature in certain classrooms is too cold.
- It is always cold.
- The dental hygiene clinic often gets very hot and we are unable to adjust the temperature. This becomes difficult when working on patients.

Appendix B. Glossary

Descriptive statistics

Statistics used to summarize large sets of data (i.e., means, frequencies, medians). Descriptive statistics describe only the sample under consideration and are not intended to infer results to the larger population.

Frequency

A descriptive statistic that provides information about how many of a particular response or measurement are observed.

Likert-type scale

A measurement technique, employed in questionnaires and interviews, that utilizes a range of standardized response categories such as strongly agree, agree, etc.

Mean

The average score of a set of data calculated by adding all scores together, then dividing by the number of scores.

N

The number of subjects or participants responding to the questions, or a single question, in the study.

Reliability

The repeatability or replicability of findings; the same results are produced each time. Instruments and procedures should produce the same results when applied to similar people in similar situations, or on a second occasion.

Standard deviation

A statistic used to measure the variability of a group of scores (how different scores are from each other and the mean). For example, if the range of scores is 1-7 and the mean (average) is 5.0 with a standard deviation of 1.0, then the scores are closely clustered around the mean, i.e., there is one unit of variation among all scores. If the mean was 5.0 and the SD was 3.0, there is a broader range of variation among the scores...a smaller SD means the scores are similar and the mean score is likely to be more accurate and more useful (this is better!).

Validity

The extent to which an instrument or procedure measures what it is intended to measure (internal validity). The generalizability of results to another population (external validity).