

Building Renovation Design Partnership with Non-Profit Agency: Documenting the Programming Phase of a Graduate Student Team's Design Project

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ABSTRACT

Exploratory, service-learning project was conducted by graduate students enrolled in a design studio course. Non-profit partner was a local food pantry which required impoverished clients to physically visit their facility to acquire groceries. Student team anticipated non-profit's clients would have disabilities and manifest challenges when visiting food pantry. Graduate students used a questionnaire and existing building conditions to inform food pantry renovation. Team documented 1) light levels and other lighting attributes; 2) physical dimensions/clearances. Team compared conditions to industry standards. Team developed open- and closed-question staff questionnaire, based on "evidence-based design" (EBD) framework. Questions addressed staff's perceptions of clients' disabilities/conditions; physical aspects of existing facility; modification preferences. Findings revealed clients exhibited: chronic pain, diabetes, hearing problems, limited mobility, limited reach, obesity, prone to falling, and vision problems. Staff noted inadequacies and potential modifications (i.e., movable furniture, extra seating, braille signage). Some building features did not comply with standards. Students then developed first phase of "real-world" design renovation, programming. Team used questionnaire findings, building documentation, baseline performance measurements, and building standards review to complete programming phase of renovation, designed to improve

non-profit facility. Graduate student design team completed a meaningful “real-world” service-learning project with project-based learning, potentially aiding food bank clients.

Keywords: Graduate design project, Service-learning, Non-profit

1. Introduction

The United States Department of Agriculture (USDA), reported lower-than-the-national-average food security in Oklahoma households [1]. Nolen [2] reported that in the State of Oklahoma, almost 700,000 “are food insecure” (p.3); many of these persons are children; and economic downturns in the state have exacerbated the hunger problem. Parents may be faced with the choice of purchasing food or paying their electric bill; many individuals may skip meals.

The problem is especially dire for older adults as “1 in 11 seniors choose between buying food or paying for medical care” [2]. Food banks and their smaller counterpart, food pantries, located throughout the U.S., provide relief to community members in need of groceries.

During an average month in 2020, during the global pandemic, a food pantry in an Oklahoma town, provided groceries to 1,315 households with persons living in poverty [3]. This food pantry was located near the University where a researcher-designer graduate student team participated in a Fall 2020 course with project-based learning (PBL), programming of needs, Evidence-Based Design (EBD) and service-learning (SL) requirements.

According to Scott [4], “Unlike traditional school projects that often take place at the end of a unit, project-based learning, or PBL, is an educational philosophy that calls upon students to take on a real-world question...and explore it over a period of weeks.” Bell [5] explained that “Project-Based Learning (PBL) is “an innovative approach to learning”. PBL is especially applicable and beneficial to today’s students [5]. Project-based Learning has been used by a variety of disciplines [6, 7, 8, 9, 10]. Other Universities have previously signed agreements enabling their students to participate in project-based learning (PBL) [6] and some have utilized “learning agreements” [11]. Learning agreements and/or project-based learning (PBL) have been used in elementary school education, middle school education, undergraduate education, and graduate education [5, 7, 11, 12, 13]. Some other educational institutions utilize service-learning. Previous SL researchers have determined that courses in design disciplines have offered SL-based projects [14, 15]. The current project was determined to have met the requirements for SL. Student reflections and other relevant materials were previously presented

by the team at a service-learning conference [16]. SL often involves community partners, community projects and student reflections.

Other University entities have signed Memos of Understanding (MOUs) to support collaboration with partners. MOUs provide an opportunity for both the University and the Community Partner to consider various aspects of the relationship, including specific roles, timelines, and channels of communications, before the project commences [17, 18]. In general, MOUs have long been considered a best practice for risk management of university-community partnerships [19, 20].

Enhancing the lives of the community members who regularly visited the non-profit food pantry building, to acquire groceries, was a goal of the team. The existing food pantry facility catered to their community members who were in need. The food pantry referred to their community members as “clients”. Clients arrived and wait their turn at the food pantry, completed paperwork, met with staff, select and package groceries, and departed with groceries. These client steps in the “shopping” process required seeing, hearing, walking, reaching, lifting and other physical actions.

While a connection between poverty and disability seems probable, some [21] have reported that the exact relationship is still unclear and warrants more research. Nonetheless, the designer-researcher team was especially concerned that the food pantry's clients may have disabilities that could negatively impact their physical experiences at the current food pantry facility.

This existing facility included the following interior spaces: retail space, support spaces, warehouse and offices. Administrators of the food pantry described the scope of the facility as follows,

“Dealing with the challenges of today requires problem-solvers who bring different perspectives and are willing to take risks. (The food pantry facility) ... emerged out of a pursuit to inspire and support the community, and a desire for actions to speak louder than words. We're an organization, established in 2017, driven by progressive ideas, bold actions, and a strong foundation of support. We formed from as a combination of several local food pantries. We offer grocer assistance and resources to address the underlying issues that come with hunger with the goal of helping... residents step out of poverty” [3].

The enrolled graduate students were given an assignment to develop the first phase of a design renovation (programming of needs) for the interior spaces, especially the “retail” space (where groceries are displayed and selected), of this local food pantry facility. A designer-researcher team approach was utilized. The designer-researcher team was required to produce the “pre-design” or “programming of needs” phase as a beginning to this “real-world” renovation design project. The programming phase often includes documenting and assessing existing facilities, uncovering client and end-user needs, and performing research by studying reference materials and best practices.

According to Piotrowski [22], “Phases of an interior design project...generally fall into these five phases: (1) programming, (2) schematic design, (3) design development, (4) preparation of contract documents, and (5) contract administration. Numerous tasks are performed in each phase...” (p. 533) [22]. “The programming phase is the information-gathering portion of an interior design project. The designer seeks as much information as possible on such things as client expectations, functional needs, aesthetics, and factors concerning the interior itself...” (p. 533) [22].

Winchip stated that “Programming should be considered the most important phase of the entire project...” (p. 290) [23]. According to Winchip, to initiate the programming phase, specific categories must be considered such as “Accessible: Pertains to building elements, heights and clearances implemented to address the specific needs of disabled people...Functional/Operational: Pertains to functional programming- spatial needs and requirements... and “Productive: Pertains to occupants’ well-being ... including building elements such as...lighting...” (p. 291) [23].

Further, Nussbaumer (p.4) suggested that “Evidence-based design (EBD) is the approach that designers take to attain the highest quality of research that leads them to the best possible design solutions” [24]. According to The Center for Health Design, “Evidence-Based Design (EBD) is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes” [25]. Included in this process are these two important steps: “Develop a hypothesis.” and “Collect baseline performance measures [25]. The student designer-researcher team was required to utilize EBD in their graduate level design course and was required to develop a hypothesis as well as to collect performance measurements in the existing food service facility.

Researchers have reported on EBD as associated with healthcare design projects [26]. Nussbaumer reported on EBD applications to various building types including healthcare, offices

and hospitality projects [24]. Friedow (p. 4) stated that “EBD needs to be integrated into different stages of the building design process.” [27]. The Council for Interior Design Accreditation (CIDA) 2020 Professional Standards states that “Student work demonstrates the ability to apply knowledge and skills learned to...“execute the design process” including the “pre-design” stage [28]. The Pre-design stage may include “quantitative and qualitative programming” of needs [28]. CIDA Professional Standards (2020) includes:

“Standard 8. Design Process (which states that) Interior designers employ all aspects of the design process to creatively solve a design problem...This standard ensures graduates can employ methods of inquiry, data collection, and analysis to appropriately frame design questions...Student Learning Expectations (include that students) “synthesize information to generate evidenced-based design solutions...execute the design process: pre-design, quantitative and qualitative programming...” (p. II-21).

Other researchers, such as Camill utilized empirical information in their courses [29]. Camill utilized energy audits in a capstone student activity [29]. Nussbaumer suggested that “it is of primary importance that students learn the process of research and apply it to their projects” [24]. The Center for Health Design has declared that understanding stakeholders’ inputs are necessary for successful projects [30]. According to the Center for Health Design, stakeholders may include “staff”. However, no published studies were found which documented graduate level interior design students conducting pre-design programming of needs for their clients or for graduate design students conducting staff surveys. Previous researchers have examined existing conditions in various facilities and utilized various instruments to collect baseline performance data to inform potential [31, 32, 33].

Baseline data may be compared to Illuminating Engineering Society (IES) recommendations. IES is considered the lighting authority in North America [34]. The IES has published recommendations for light levels (in footcandles) for various horizontal work tasks (i.e., working at a desktop, wrapping packages) and vertical work tasks (i.e. working on white boards, examining products on shelves) in various building types including merchandising spaces [34, 35]. According to DiLaura et al., footcandles are the units indicating the amount of illumination produced by a source of one candle at a distance of one foot [34].

IES also published Light Reflectance Values (LRV) recommendations for room surfaces [34]. Lower LRV can negatively influence light levels. “No other surface in a typical room will contribute more to the distribution of light than the ceiling” [36].

All of the effects of lighting on shoppers are not fully known. Summers and Hebert found that variance in light levels can affect the amount of time shoppers looked at merchandise displays, touched items on displays and picked up items from displays [37]. Clare et al. tested Light Emitting Diode (LED) bulbs in a simulated shopping setting and found Warm White bulbs more favorably influenced consumers of beef products than did Cool White LED light bulbs [38].

Color Rendering Index (CRI) describes how objects are perceived under a given light source on a scale of 1 – 100; low CRI light sources make objects illuminated by them appear unnatural and higher CRI light sources renders objects more natural. According to Waveform, “CRI values that are 90 and above are considered excellent, while scores below 80 are generally considered poor” [39].

DiLaura et al. also explains that correlated color temperature (CCT, Kelvin) is defined as the measured temperature at which a standard black body radiator emits light at a specific spectral distribution; low Correlated Color Temperature light sources appear warmer (yellowish to reddish light) while higher CCT sources appear colder (blueish light) [34]. Some feel that warm sources are friendlier and evoke a feeling of “home” or intimacy, whereas, cooler sources evoke a more business or clinical setting.

2. Methodology

The course instructor contacted the Coordinator of Community Engagement at the College's Office of Extension, Engagement and Continuing Education and asked for assistance regarding the identification of suitable non-profit agencies with which the University, and specifically the instructor and students enrolled in a graduate design studio course, could partner. The course instructor sought a local, non-profit agency with which the University could partner and make an agreement. The University had a pre-established procedure and template for developing Memos of Understanding (MOU). The MOU was drafted and the University representatives and the non-profit agency signed the agreement. Refer to Figure 1 for the anonymized MOU.

I. PURPOSE

This memorandum of understanding between the "UNIVERSITY" and the "COMMUNITY PARTNER", sets out the terms and conditions of their proposed collaboration set forth this 15th day of July, 2020.

WHEREAS, COMMUNITY PARTNER operates a food resource center and seeks to address the underlying issues that come with hunger to help County residents step out of poverty; and

WHEREAS, COMMUNITY PARTNER serves individuals and families; and

WHEREAS, the UNIVERSITY is committed to collaborating with communities for the mutually beneficial exchange of knowledge and resources in the context of equity and reciprocity; and

WHEREAS, the UNIVERSITY and COMMUNITY PARTNER share a joint interest in serving residents of Stillwater and Payne County by improving the occupational functionality of the facilities through which the COMMUNITY PARTNER operates its variety of programs; NOW THEREFORE, the parties agree to the terms of this MOU as follows.

II. REPRESENTATION AND COORDINATION

Each party will appoint official contacts to coordinate the activities described in this MOU.

III. RESPONSIBILITIES

During the extent of the collaboration described in this MOU, the parties agree to complete the following actions and provide the following resources. The UNIVERSITY will

- Require students enrolled in the Graduate Design Course to complete a service-learning project in collaboration with the COMMUNITY PARTNER over the course of the Fall 2020 semester, beginning August 2020 and ending December 2020.
- Assign a student, or team of students (1-3), to work with the COMMUNITY PARTNER. As a learning exercise, students will seek to understand how the COMMUNITY PARTNER uses its existing site and will brainstorm ideas for making physical improvements. COMMUNITY PARTNER should be aware that the students are not certified, licensed or registered professional interior designers and their work should be considered student work and strictly preliminary in nature.
- Communicate regularly with the COMMUNITY PARTNER to share updates, discuss opportunities, and address challenges.

The COMMUNITY PARTNER will

- Provide building plans for their building to students.
- Introduce your agency's mission and offer a brief tour of your facility via video.
- Allow students to interview or survey at least one staff person and Executive Director regarding use of space.
- Allow students to observe how staff and clients utilize the existing site.
- Allow students to photo-document the existing site. No people will be included in the photographs.
- Allow students to develop an existing inventory of furniture, office equipment, etc. and photograph and measure these items.
- Communicate regularly with the UNIVERSITY to share updates, discuss opportunities, and address challenges.

IV. SCOPE AND LIMITATIONS

The terms and conditions listed in this MOU shall apply to all activities related to the project described herein, with the exception of weather or safety or public health issues preventing participation.

V. LIABILITY

UNIVERSITY does not waive its sovereign immunity as established in the Governmental Tort Claims Act, 51 O.S. § 151 et seq., and nothing contained in this agreement should be interpreted as such a waiver. The parties acknowledge that, at the time of execution of this MOU, an inherent risk of exposure to COVID-19 exists in any public place where people are present. COVID-19 is an extremely contagious disease that can lead to severe illness and death. UNIVERSITY expressly disclaims all liability associated with exposure by any participant or other individual to COVID-19 as a result of the performance of this MOU.

VI. TERMS OF UNDERSTANDING

Term and Renewal The term of this MOU is for a period of one (1) year from the effective date of this agreement automatically renewable unless one or both parties elect to modify or terminate the relationship. It shall be reviewed by all parties at least biennially to ensure that it is fulfilling its purpose and to make any necessary revisions.

Modification of MOU Modification to this MOU will be documented in writing and agreed to in writing by both parties.

Termination Either organization may terminate this MOU without penalty or further liability upon sixty (60) days written notice to the other party.

Authorization This MOU shall take effect upon signing by both parties and will remain in effect unless and until modified or terminated.

The Community Partner
Executive Director

the University

Signature/Date

Signature/Date

Department Head,

Signature/Date

Vice President for Research

Signature/Date

Figure 1 University Memorandum of Understanding (MOU).

2.1 Hypotheses

As part of the EBD process, the team hypothesized that many of the local food pantry's clients would have conditions or disabilities that caused them challenges as they navigated the facility to collect their groceries. The team further hypothesized these issues could be addressed via facility design modifications. The designer-researcher team also hypothesized that the food pantry staff could identify their clients' disabilities and provide insights into their facility's weaknesses via a questionnaire. It was anticipated that researcher-designers could use these findings to inform the programming stage of the facility's renovation design. The designer-researchers also sought to gather baseline performance measurements and compare to standards to determine compliance and make recommendations. As some parts of the existing food pantry facility are older, the team anticipated the facility may not comply with all of the current standards.

2.2 Baseline Performance Measures

As part of the EBD process, the team needed to collect baseline performance measures. After an initial tour of the existing food pantry facility and a meeting with staff members the designer-researcher team utilized a variety of instruments to acquire data in-situ. All of the devices utilized to gather baseline performance in-situ for this project may be found in Table 1. Portable Devices.

The team used several other portable instruments to acquire data. A light meter was used to measure the existing lighting conditions (illuminance, measured in footcandles on task surfaces) of main spaces such as "circulation", "feature displays", and "general retail" and those measurements were then compared to Illuminating Engineering Society (IES) recommendations [34]. A spectrometer was used to record measurements of Correlated Color Temperature (CCT), and Color Rendering Index (CRI) (Refer to Figure 2). A tape measure was used to determine dimensions of key areas (Refer to Figure 3). The ADA Checklist for Existing Facilities Institute for Human Centered Design [40] was consulted to determine if the existing building measurements complied with ADA guidelines. The team visually matched existing room finishes on floor, wall and ceiling to color swatches in the Sherwin-Williams Paint Chip Fan Deck and noted Light Reflectance Values (LRV) as compared to IES and EPA guidelines.

Table 1 Portable Devices used by graduate students to gather data about existing food pantry building conditions

Image	Name	Manufacturer or Reference	Model #	Description
	Smartphone Cameras	Apple	Iphone 11	Utilized to capture images of existing conditions.
	Light Meter	Sylvania	DS2000	Utilized to measure light levels (illuminance) on work surfaces.
	Spectrometer	Asensetek	Lighting Passport Pro	Utilized to measure CCT and CRI data.
	Tape Measure	Tool City	63700 Read Easy	Utilized to measure dimensions of the existing site.
	Paint Chip Fan Deck	Sherwin-Williams	Color Snap	Utilized for visual matching for LRV.



Figure 2 Graduate student utilizing a spectrometer in-situ to gather lighting data in the existing food pantry facility.



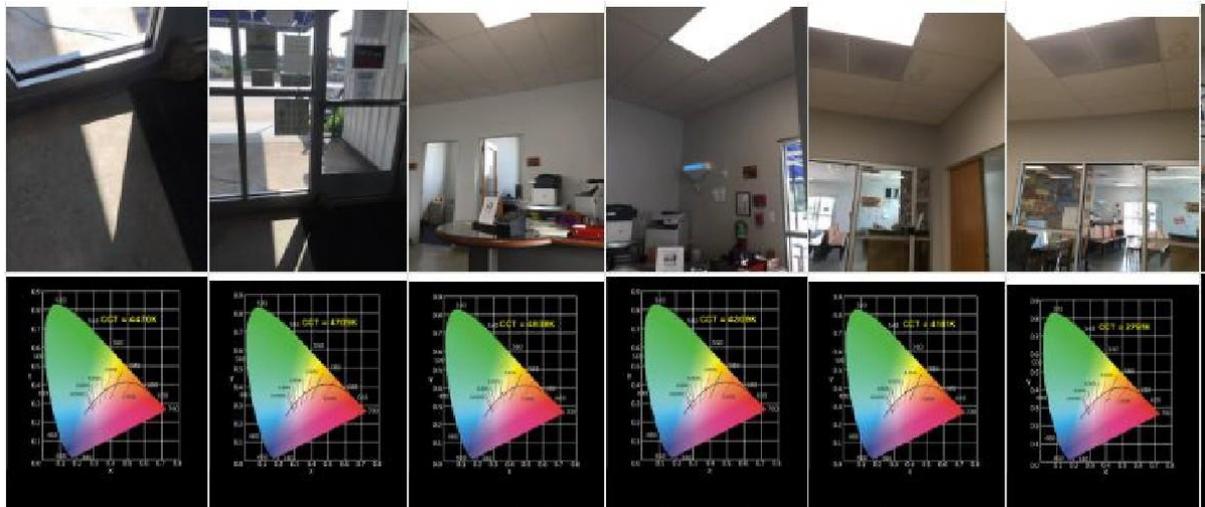
Figure 3 Graduate student using a tape measure in the existing food pantry facility to determine interior dimensions.

2.3 Questionnaire

During the study period, the designer-researcher team developed a questionnaire which they then administered and analyzed as a basis for the qualitative part of this in-class EBD programming of needs research. The questionnaire was inspired by sample surveys found in the appendix of Nussbaumer's Evidence-based design for interior designers [24]. The questionnaire was reviewed and approved by the University Institutional Review Board (IRB) for use with human subjects prior to its administration to staff members at the food pantry. The questionnaire utilized 44 open-ended and close-ended questions.

3. Results

The designer-researcher team utilized a digital spectrometer to record measurements of Color Rendering Index (CRI). Considerable variability was found across spaces within the existing food pantry facility. Readings ranged from 74-92 CRI. Refer to Figure 4.



Parameter	entrance	entrance	front desk	front desk	retail entrance	retail entrance
CCT	4470 K	4709 K	4 838 K	4309 K	4 1 8 1 K	279 1 K
Duv	0.0056	0.0059	0.0068	0.0042	0.003	-0.0228
CIE1 93 1 X	0.3643	0.3557	0.351 6	0.37	0.3746	0.4188
CIE1 931 y	0.3779	0.372	0.3707	0.3789	0.3794	0.3450
CRI(Ra)	87	90	92	84	82	74
Re (R1 - R15)	82	86	89	77	75	65
CQ.S	87	90	93	83	81	85
TLCI(Qa)	87.7	93.8	97.7	76.5	70.5	57.2
OAI	74.9	78.5	80	73.1	72.2	100.7
TM-30 -1.5 Rf	89	92	95	85	83	72
TM -3 0- 15 Rg	95	96	97	95	94	117
I ll u m i n a n c e	607 lux	381 lux	108 lu x	831 lux	1 027 lux	o lux
Foot Cand le	50.4 fc	35.4 fc	10.0 fc	77.2 fc	95.4 fc	0.0 fc
PP FD(400 - 70Dnm)	9.37 pm ol/ m's	6.17 pmol/ m's	1.81 μmo l/ ITf s	12..10 μmo l/If s	1 4.55 J.Jmo l/ m's	0.01 μm ol/ m's
Ap	578 nm	578 nm	675nm	453 nm	453 nm	407 nm
AD	574 nm	572nm	570 nm	575nm	577 nm	599 nm
Purity (Pe)	23%	18%	17%	25%	26%	29%
SP R tin	1 Q			1 A	1 7	''

Figure 4 Spectrometer output display including photographs of existing food pantry facility and corresponding CCT, CRI and Footcandles.

The designer-researcher team also utilized the digital spectrometer to record measurements for Correlated Color Temperature (CCT). Most of the 18 CCT measurements fell within the range 4114K - 4838K, meaning that the majority of spaces had neutral white lighting.

However, there were several inconsistencies throughout the facility. There were three outliers with relatively low CCT that fell between 2747K and 2967K. Therefore a few of the food pantry spaces had warm white lighting. Refer to Figure 4.

The team also made illuminance readings with the light meter in the existing food pantry facility and confirmed them with the spectrometer readings. The facility exhibited variability with a range of 0 fc (0 lux) to 95.4 footcandles (1,027. lux). Refer to Figure 3. IES handbook's published recommendations for grocery/supermarket stores were 75 fc (750 lux) (IES, 2001). Therefore, the measured light levels in the existing food pantry facility did not comply with standards.

While the majority of interior spaces in the existing food pantry facility were found to provide adequate accommodations according to a comparison of the in-situ findings to the Americans with Disabilities (ADA) checklist, there were some categories that were lacking. None of the facility's spaces exhibited braille signage. The existing signage lacked the proper contrast of text to background. No wheelchair spaces had been designated in the facility's client seating areas.

To aid in the proper distribution of light, a white or nearly white ceiling is recommended, with a minimum reflectance value between 0.80 and 0.85" [36]. Rooms with daylighting contributions should have a ceiling LRV of .90 or greater [34]. An examination of the existing food pantry facility revealed that some daylighting contributions entered through glass doors. "Medium LRV (39%) finishes were observed for ceilings and floors; "light" to relatively "dark" LRV were observed for floor finishes (7%, 20% and 77%). Therefore, the measured LRV did not fully comply with recommendations in the existing food pantry facility.

The online questionnaire responses provided a plethora of information regarding the current food pantry facility and its clients. Six completed questionnaires were received from the staff. The response rate was 85.71%. The designer-research student team analyzed the results using descriptive statistics. Results showed that the staff identified the clients as having disabilities or conditions such as amputated limbs; bariatric needs (obesity); diabetes; disability conditions in fingers or hands; hearing disability or deafness; heart condition; illiteracy; limited mobility; limited reach; muscle weakness; prone to falling; tremors; and vision problems, low vision or blindness. Refer to Figure 5 for staff's perceptions of clients' conditions or disabilities. Deafness or hearing disability was reported by all (n=6, 100%) of the questionnaire respondents. All of the conditions listed in the questionnaire (n=20, 100%) had been observed by at least one staff member.

Please indicate which condition you have observed or have knowledge of for clients. Check all that apply.

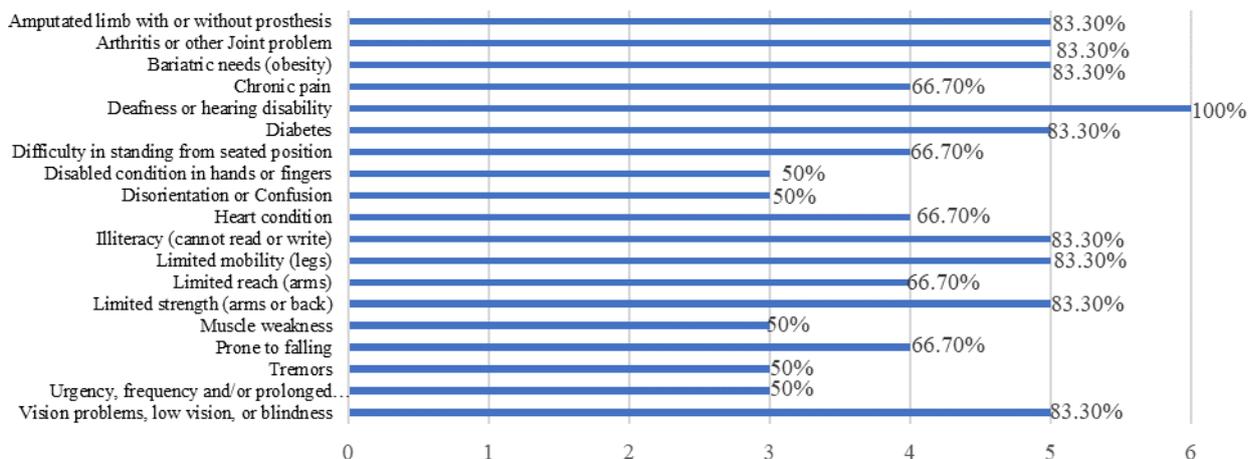


Figure 5 Questionnaire response results indicating staff member-observed client conditions.

The results also showed that staff respondents indicated eleven modifications to be made to the current facility to improve conditions for their clients, including American Sign Language (ASL) resources, automated doors, braille signage, extra seating movable furniture, wheelchair clearances, and wider aisles. Staff indicated that they recommended most (91.66%) of the modification options offered in the questionnaire. Refer to Figure 6 for response results indicating staff-members' perceptions of needed facility modifications.

Mark any accommodations needed for special needs clients.

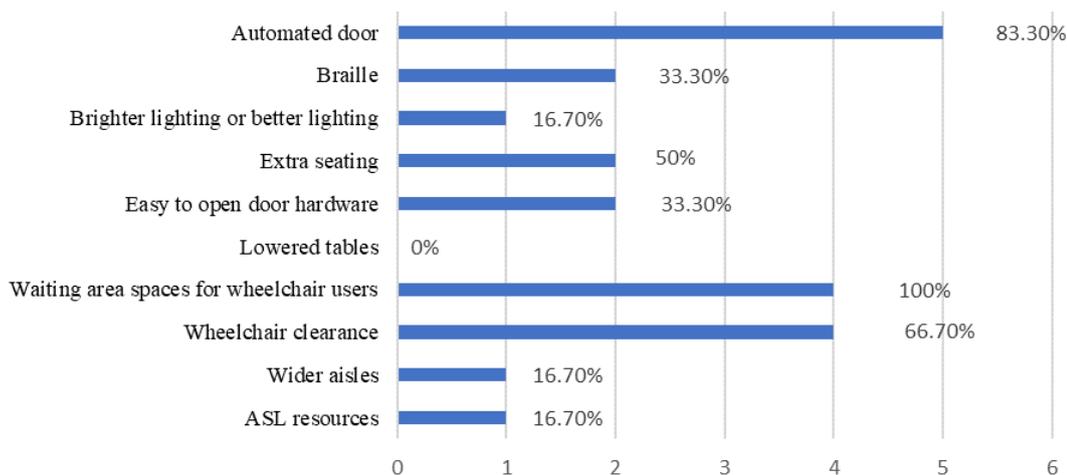


Figure 6 Response results indicating staff-members' perceptions of needed facility modifications.

The results of the programming were submitted in partial fulfillment of course requirements. The student team formally presented their programming efforts to the facility director, albeit over Zoom due to the pandemic.

6. Discussion and Limitations

The EBD process and food pantry renovation design project were found to be useful as teaching tools for students in a “real-world” project. The current research was a case study and therefore has limited generalization opportunities. The number of staff members at the non-profit facility was very limited so results from the questionnaire have limited generalizability. This study was conducted during the global pandemic and the food pantry temporarily shifted to a pre-packaged, drive-through pickup of groceries, so the student team's direct interaction with non-profit facility's clients was not possible.

7. Conclusion

Based on the analyzed results, the hypotheses were accepted: food pantry staff could identify their clients' disabilities and staff provided insights into their facility's weaknesses via a questionnaire. Researcher-designers could use these findings they collected to inform the programming stage of the facility's renovation design. The team was also able to gather baseline performance measurements from portable devices in-situ as well as from the questionnaire. The team was able to compare results to standards to determine compliance and to make recommendations. The results of this research study suggested that evidence-based design (EBD) can be an effective tool in pre-design and programming of needs. This innovative study included aspects of teamwork, programming phase of design process, community engagement and service-learning.

8. Recommendations

The food pantry facility renovation design should move forward into additional design stages. The facility should consider incorporating the baseline measurements, compliance reports and questionnaire findings into facility improvements which may improve the facility visit experience for their clients, perhaps repeat some of the findings such as signage with proper contrasting colors and braille options, more accommodations for wheelchairs, etc.

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