RETHINKING CLASSROOM DESIGN: STRATEGIES FOR CREATING

INCLUSIVE LEARNING ENVIRONMENTS

by

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(Under the Direction of Janette R. Hill)

ABSTRACT

Classroom accessibility to meet the diverse needs of students in higher education can be challenging. The ADA (1990) was enacted into law in the United States more than 25 years ago. Yet despite legislative reform, many U.S. colleges and universities struggle to meet accessibility standards in their instructional facilities. The purpose of this case study was to explore the perspectives of undergraduate students served by the University of Georgia Disability Resource Center on how the physical classroom space impacts learning for students with disabilities. Results from an explanatory mixed methods design indicated that how classroom designs impact learning depends on individual student needs. That said, the data showed concurrence across several classroom design features impacting the learning experience, including furniture, access, technology, and environmental features of a space. Participants indicated these features impacted their learning experience in various ways, including impeded access and participation, barriers for learning, and distractions and sensory impacts. The results of this study indicated that accessibility is a complex process involving many constituents on campus, from facility planners to institutional leaders to faculty. By adopting more inclusive principles such as Universal Design, we can broaden current accessibility practices that focus solely on

users who are disabled to address a broader consideration: "How can we rethink

classroom design so it benefits all?"

INDEX WORDS: Disabilities, Universal Design, Classroom Design, Learning
                 Environments, Higher Education

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DEDICATION

This one's for me, this one's for me

Not for anyone else, I need it you see

I threw all I had into the sea

Now I want a little back, this one's for me

— Tom Petty

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CHAPTER 1

INTRODUCTION

Classrooms play a significant role in the face-to-face teaching and learning process in higher education institutions. It is important that universities have a sufficient number of appropriately designed classroom spaces to support the teaching and learning mission of the institution (Johnson et al., 2015). The physical features of the room pre-determine class size, impact instructional activities, and directly or indirectly influence personal interactions (Baker & National Clearinghouse for Educational Facilities, 2012; Johnson et al., 2015; Weinstein, 1979). The effective design of classrooms ensures institutions are making sustainable, long-term investments that support pedagogical practices and promote student learning (Baker & National Clearinghouse for Educational Facilities, 2012; Johnson et al., 2015).

Research in learning environments is expansive within the field of learning, design, and technology, resulting in studies exploring online, virtual, or simulated learning environments, maker spaces, flipped classrooms, and active learning environments, to name a few (Johnson et al., 2015; Kolb & Kolb, 2005; McCallum, Schultz, Sellke, & Spartz, 2015; Rossi et al., 2015). However, this research tends to focus on the design of instruction, integration and use of technology, and/or strategies for student engagement. While important contributions to our understanding of learning and teaching, the physical design of the classroom is often overlooked in ongoing research and discussions related to the effective design and delivery of formal instruction. We

need more research to better understand the impact of classroom design on the teaching and learning process.

Determining how the physical classroom space impacts learning is not straightforward; there are several ways to measure their effectiveness. One area that serves as a starting point for investigation is research identifying features in classroom designs that impact students with disabilities. There are legal requirements in place to ensure standards for equal access for users with disabilities including the 2010 ADA Standards for Accessible Design and the Americans with Disabilities Act of 1990. For example, the Americans with Disabilities Act (ADA) establishes standards for access to buildings and classrooms, as well as defining the number and placement of accessible seating locations in a classroom. There are also established design strategies, such as user-centered design and Universal Design for Physical Spaces that are derived from the ADA accessibility requirements (Norman, 2013; Story, Mueller, & Mace, 1998). Examples include Norman's (2013) Fundamental Principles of Interaction and The Center for Universal Design's (1997) Principles of Universal Design. Each provides practical strategies for evaluating existing designs and guiding the physical classroom design process in multiple contexts including construction or renovation, everyday items such as furniture or appliances, and even software development.

The established access requirements and standards serve as a baseline against which student perceptions of design effectiveness may be measured. Yet, evidence suggests that not all university classrooms are accessible, and the need for accommodation requests indicates that accessible classroom designs may not meet all student needs (Disability Resource Center, 2017b, 2017c; Pettus & Office of Disability Services, 2012). Examples include offering students alternative standalone furniture

options (e.g., desks, tables, or chairs) when the furniture in a given classroom is not accessible to a student, or moving classes to an accessible location when accommodations cannot be offered in the originally assigned classroom (Disability Resource Center, 2017d). Further exploration is needed to fully understand students' needs and their perceptions of how well those needs are being met.

Statement of the Problem

Classroom accessibility in higher education continues to be a barrier against the diverse needs of users despite legislative reform. The ADA (1990) was enacted into law in the United States more than 25 years ago, yet many U.S. colleges and universities still struggle to meet accessibility standards in their instructional facilities. It is not a requirement by law that all buildings be accessible, and to provide access, classes may be relocated to accommodate a person who has declared a disability (Disability Resource Center, 2017a, 2017b; Pettus & Office of Disability Services, 2012). This practice focuses solely on users who are disabled rather than addressing a broader consideration: "How can we rethink classroom design so it benefits all users?"

A more inclusive perspective draws on the theory of affordances and the concepts of Universal Design for Physical Spaces, promoting best practices for user-centered design and design for all users (Norman, 2013; Story et al., 1998). Reframing the issue may not only provide access to those in need, but it may also remove barriers and potential stigmas associated with accommodating a small group of individuals while focusing on improving access to everyone. While the promise for improving the classroom space is possible for all, the research to assist designers and developers in this effort is lacking. There is a need to study the affordances of physical classroom designs and how current designs impact student learning to support recommendations for change.

Purpose and Research Questions

The purpose of this study was to explore the perspectives of undergraduate students served by the University of Georgia's (UGA) Disability Resource Center (DRC) on how the physical classroom space impacts learning for students with disabilities. The research questions for the study included:

1. To what extent do students perceive the design of a classroom space impacts their learning experience?

2. What aspects of classroom design do students identify as impacting their learning experience?

3. How do these student-identified aspects of classroom design impact their perceptions of their learning experience?

An explanatory mixed methods design was used for this case study, drawing inferences about collected quantitative data through in-depth qualitative data analysis. Quantitative survey data were collected from student participants at a selected university to explore what classroom design features students perceive impact their learning. The survey results were presented to focus groups for review and discussion. Qualitative data collected during focus groups explored perceptions of how identified features impact learning for students at the university, providing a richer context for interpreting the quantitative results.

Significance of the Study

There is a need to review our assumptions and decisions made about classroom design in our teaching and how it impacts student learning experiences. The results of this study have the potential to impact how we design classrooms and in doing so impact student perceptions of their learning experiences. The limited research related to

classroom design and student perceptions of student learning experiences provides opportunities to conduct further research. With this in mind, this dissertation study focused on the impact of classroom design on learning experiences for undergraduate students with disabilities in the context of higher education.

A higher education context was selected for this research from a practical perspective: the design of a classroom impacts student access to a given learning environment. There are laws in place in the United States designed to ensure equal access for students with disabilities (*2010 ADA standards for accessible design*, 2010; Americans with Disabilities Act of 1990, 1990); however, not all university classrooms are accessible and those that meet accessibility requirements may not support the learning needs of the students they are designed to accommodate. This study aimed to establish a baseline measure of classroom design features that students perceive impact their learning experiences. In doing so, this study sought to provide guidance for designers and developers of classroom spaces to provide better accommodations for all.

Overview of the Dissertation

This dissertation is organized into six chapters. The first chapter provides an introduction to the study including the statement of the problem, purpose, research questions, and significance of the research. This is followed by Chapter 2, in which a review of the literature and the conceptual and theoretical foundations that frame the study are presented. This includes an overview of classroom design, compliance, and practice as well as concepts of Universal Design and the Theory of Affordances. In Chapter 3, the study's methodology is presented, and the research methods used to collect and analyze the study's survey and focus group data are outlined. The results of the study are discussed in two chapters: the results of the survey data are presented in Chapter 4,

and the results of the focus groups are presented in Chapter 5. Finally, Chapter 6 presents

cumulative findings of the study as well as implications for practice and research.

CHAPTER 2

LITERATURE REVIEW

Introduction

For many people, the term "disability" conjures the mental image of an individual with a visible physical disability, such as a wheelchair user. This is further underscored by the wheelchair symbol commonly used in the United States to identify accessible entrances to buildings, parking spaces, and even seats in the movie theatre. Similarly, people encounter braille characters next to elevator buttons to aid visually impaired riders and closed captioning settings on televisions to assist viewers who are deaf or hard of hearing. However, the range of disabilities extends beyond these common examples.

Most people will encounter some form of physical disability at some point in their lives, whether through a temporary injury like a sprained ankle, a broken arm, or simply experiencing the normal signs of aging such as loss of balance, vision, or hearing (Story et al., 1998). For younger adults, however, physical disabilities are less prominent. According to a report from the CDC, cognitive disabilities (10.1%) ranked as the highest disability type among adults between the ages 18 and 44 compared to mobility disabilities (5.5%) and vision disabilities (2.9%) (Courtney-Long et al., 2015). How users with cognitive disabilities encounter physical spaces is not something people are typically cognizant of, but the experiences of users with cognitive disabilities have real implications for the design of physical spaces and the structures (real and perceived) that support the intended use of a given space.

Understanding the range of disabilities, particularly the prominence of cognitive disabilities for younger adults attending college, and current classroom designs and practices for meeting accessibility requirements has implications for this study, future research, and practice. The primary resource used to identify literature for this review was GALILEO, an online repository that enables searching across more than 400 databases across a variety of subjects (GALILEO Library, 2019). GALILEO databases (e.g., Art & Architecture Source, Education Research Complete, Environment Complete, ERIC, GreenFile, PsycINFO, etc.) were used to search for peer-reviewed scholarly articles in reputable journals. Hundreds of articles were reviewed during the last two years using search terms that included accessibility, affordances, classroom design, disability, higher education, and Universal Design.

References from collected articles were used to identify additional resources, leading to more searching in GALILEO and GIL, the UGA Libraries catalog. In addition to the GALILEO databases and UGA catalog, resources were obtained via interlibrary loan, peers, and other scholars. Finally, Web searches were conducted via the Google® search engine, Google Scholar®, and Google Books® to identify relevant literature to inform the review and to guide the overall study.

In this chapter, the literature used to inform the study and provide a foundation for understanding the results of the research are presented. The chapter begins with a review of the literature on classroom design, requirements for compliance, and practices to meet classroom design compliance in higher education. This is followed by an introduction to the conceptual and theoretical foundations that frame this study; these include an overview of the concepts of Universal Design and the Theory of Affordances. Research studies are used to illustrate the primary concepts throughout the review as relevant and

applicable. The chapter ends with a summary of the literature, including areas that need additional exploration.

Classroom Design, Compliance, and Practice

Colleges and universities in the U.S. invested heavily in classroom construction, renovation, and maintenance (Abramson, 2015; Argon, 2009). According to the College Planning and Management magazine's 20th Annual College Construction Report, institutions invested more than $12 billion dollars in 2014 toward construction projects (Abramson, 2015). Of that, nearly $9.5 billion was invested in new construction, $1 billion in building additions, and nearly $1.5 billion in retrofitting existing structures. Academic buildings accounted for most of the construction that was reported, totaling 79 buildings with a median size of 55,820 square feet and a median cost of $20.25 million.

These construction and renovation projects are designed to meet instructional needs, and they must adhere to a series of codes, standards, and regulations. Architects and facilities planners often make design choices that balance the instructional needs and compliance requirements with institutional and project constraints (e.g., budgets, stakeholder preferences, structural and environmental limitations, etc.). In this section, the changes and trends in classroom design for instructional use are explored. This is followed by a discussion about regulations that establish classroom design standards, how those standards are commonly implemented, and measuring classroom design effectiveness.

Design for Instructional Use

Classroom design in U.S. higher education institutions is historically instructor-centered (Baker & National Clearinghouse for Educational Facilities, 2012; Beichner et al., 2007). Lecture halls and instructor-led laboratories dominate many campuses

(Beichner et al., 2007; Sommer, 1974); however, educational theory and the associated applications in pedagogy have evolved over time (Getzels, 1974; Johnson et al., 2015; Schunk, 2008). Early classroom designs catered to teaching and learning practices established in behaviorist theories (Baker & National Clearinghouse for Educational Facilities, 2012; Sommer, 1974). When formal education was first established in the United States, the purpose of a room's design was to create an environment conducive to good behavior and providing instruction to large numbers of students (Baker & National Clearinghouse for Educational Facilities, 2012).

By the mid-point of the 20th Century, educational theory focused less on learning through conditioned behavior and more on the science of cognition, or how learning occurs (Richey, Klein, & Tracey, 2011). This paradigm shift led to the Cognitivist and Constructivist movements, which emphasize the importance of content organization and delivery as well as active and experiential learning in authentic contexts (Richey et al., 2011). Traditional instructor-centered classrooms with fixed seating arrangements became less conducive to activities associated with "active learning," "blended learning," and "flipped" classroom pedagogies which were becoming pedagogical trends in higher education (Beichner et al., 2007; Getzels, 1974; Johnson et al., 2015).

In response to changing pedagogy needs, colleges and universities started investing in alternative classroom designs that facilitate small group-work, real-world simulations, and technology access and use (Beichner et al., 2007; Johnson et al., 2015). Higher education classrooms have started becoming more student-centered, utilizing movable furniture for configurable room layouts and adding technology infrastructure (Arnold, 2010; Baker & National Clearinghouse for Educational Facilities, 2012; Johnson et al., 2015). The flexibility of these classroom designs provided opportunities for

innovation and adaptation in the classroom to accommodate any number of classroom activities in various contexts.

The updated classroom designs, whether integrated into new construction projects or created as a result of retrofitting existing facilities, are required to meet updated standards for compliance across many areas (e.g., fire safety, electrical standards, plumbing standards, accessibility standards, etc.). Accessibility compliance is a key area of focus, particularly for retrofitting existing spaces. Many colleges and universities were built prior to the enactment of current laws that establish standards for accessibility, namely the Americans with Disabilities Act of 1990.

There has been considerable research conducted on the subject of classroom design in higher education. The trends of the literature published in scholarly journals over the last five years were somewhat dependent on the database used to source the information. For example, using the education-focused databases Education Research Complete, ERIC and PsycINFO, the literature returned tended to focus on case studies that analyzed student perceptions or experiences, intervention studies, comparison studies, and best practices (Albó, Hernández-Leo, & Moreno Oliver, 2018; Folkins, Friberg, & Cesarini, 2015; Nanclares & Rodríguez, 2016; Ramsay, Guo, & Pursel, 2017). The subjects of these studies overwhelmingly centered on flipped classroom pedagogies (Nanclares & Rodríguez, 2016; Rabidoux & Rottmann, 2018; Sanagavarapu, 2018), but other subjects included course design for both online and face-to-face delivery (Baldwin, Ching, & Hsu, 2018; Dumford & Miller, 2018; Klemke, Eradze, & Antonaci, 2018), active learning pedagogies (Adkins, 2018; Li, Yang, & MacLeod, 2018; Park & Choi, 2014), and technology integration strategies (Awidi, Paynter, & Vujosevic, 2019; Saunders, Oradini, & Clements, 2017; Subhash & Cudney, 2018).

In contrast, the literature returned using the Art & Architecture Source, Environment Complete, and GreenFile databases tended to focus on topics related to art education pedagogies or the environmental factors associated with a classroom's construction and its impact on student learning. Topics included flipped or active learning, temperature, lighting, acoustics, and ventilation (Barrett, Davies, Zhang, & Barrett, 2015; Coorey, 2016; de Abreu-Harbich, Chaves, & Brandstetter, 2018; Toftum et al., 2015).

Absent from this search of recent literature on classroom design and higher education were discussions surrounding disabilities, accessibility, and instructional design practices for facilitating the instructional use of classrooms. This was surprising given the substantial investment in facility renovation, which must now meet updated accessibility and building code compliance, and the introduction of active learning pedagogies in higher education (Abramson, 2015; Argon, 2009; Johnson et al., 2015; Society for College and University Planning, 2015). The requirements for building code compliance are complex and can be costly if not appropriately planned. In the following sub-sections, accessibility compliance, as well as design codes, standards, and federal regulations are discussed.

Accessibility Compliance

Colleges and universities in the United States are required to adhere to the Americans with Disabilities Act of 1990 (ADA). The ADA is a comprehensive civil rights law prohibiting discrimination against and guaranteeing equal opportunities for individuals with disabilities. By law, new construction is required to comply with the minimum accessibility standards defined in the 2010 ADA Standards for Accessible Design document. Under Title III of the ADA, both private and public colleges and

universities are expected to remove barriers in existing facilities whenever possible, and in cases where it is not readily achievable (e.g. physically or financially prohibitive), comparable alternative accommodations should be provided.

The ADA was preceded by several key examples of legislation focused on expanding equal rights for individuals with disabilities. These included the Architectural Barriers Act of 1968, the Rehabilitation Act of 1973, and the Individuals with Disabilities Education Act of 1975. Each preceding law played an important role in paving the way for the ADA and continue to guide accessibility practices in higher education today.

The Architectural Barriers Act of 1968 was one of the earliest laws to establish accessibility standards for federally funded buildings and facilities, which included publicly funded colleges and universities (Architectural Barriers Act of 1968, 1968; Story et al., 1998). The law applied to new building designs and construction projects, alterations to existing facilities, and leased facilities (Story et al., 1998). This was followed by the Rehabilitation Act of 1973 in which Section 504 prohibited federally funded employers, including public colleges and universities, from discriminating on the basis of disability and required reasonable accommodations to be provided to individuals who qualified (Rehabilitation Act of 1973, 1973; Story et al., 1998). It was later amended in 1998 to include Section 508, which required technology equipment, software, websites, and electronic documents to be accessible to individuals with disabilities (Rehabilitation Act of 1973, 1998). Access to public education was further expanded in 1975 by the Individuals with Disabilities Education Act (IDEA), which guaranteed "Free Appropriate Public Education" (FAPE) for students with disabilities (Individuals with Disabilities Education Act, 2004; Story et al., 1998). Although focused on K-12 students,

the law had implications for increasing access to higher education for students with disabilities.

Where many of the preceding laws addressed federally funded entities, the ADA expanded accessibility requirements to include private entities. For example, Title I of the ADA prohibits discrimination on the basis of disability for employers with 15 or more employees and establishes standards for reasonable accommodations. Similarly, Title III of the ADA prohibits privately owned businesses, including private colleges and universities, from discriminating in public accommodations on the basis of disability. It establishes minimum standards for building design, construction, alterations, and requires reasonable modifications and accommodations when serving individuals with disabilities.

Design Codes, Standards, and Federal Regulations

In addition to the accessibility standards listed in laws like the ADA, higher education institutions in the U.S. must adhere to a number of codes, standards, and federal regulations that define minimum requirements for buildings and interiors when designing instructional buildings and classrooms (Harmon & Kennon, 2014). However, there is no uniform scientific process for establishing and maintaining codes and standards, nor are there processes by which end user needs are checked and validated. The organizations that establish codes and standards (e.g., American National Standards Institute, International Code Council, National Fire and Protection Association, etc.) have their own procedures for creating, modifying, and publishing requirements. As Harmon and Kennon (2014) explain:

> Most of [the organizations] use a *consensus* [authors' emphasis] process to revise their publications. Each organization has a membership that consists of a wide range of individuals. These often include code officials, design professionals,

building users, academics, manufacturers, building owners, consumers,

contractors, and others. These members make up the committees that oversee the

proposed changes. However, both members and nonmembers can typically

propose and comment on changes either in writing or in person at open public

hearings. (p. 17)

Although there are specific requirements defined by jurisdictions, or geographical areas,

the codes produced by the International Code Council (ICC) and National Fire and

Protection Association (NFPA) are the most widely adopted across the country.

Commonly used codes from these two organizations include the ICC's International

Building Code and the NFPA's NFPA 101: Life Safety Code (see Table 2.1 for

examples).

Table 2.1

Examples of Common Building Codes

Code Type	Code Description
Occupancy	Defines the number of people allowed in a given building or space based on intended use, furniture, furniture placement, finishes, and accessibility/egress requirements (Harmon & Kennon, 2014).
Means of Egress	Determines evacuation and "defend in place" strategies for construction, based on accessibility law requirements in most cases (Harmon & Kennon, 2014).
Electrical and Communications Requirements	Determines where, when, and what type of electrical or communications fixtures are required during construction (Harmon & Kennon, 2014).
Finish and Furniture Selection	Defines allowed materials used within a building or space based on their fire rating (Harmon & Kennon, 2014).

As illustrated in Table 2.1, most codes are concerned with fire and life safety,

including fire prevention, suppression, and occupant evacuation (Harmon & Kennon,

2014). Fire and life safety are the primary drivers behind building construction type, size, materials codes, as well as requirements for finish and furniture selection, occupancy, egress, and many aspects of accessibility regulations. Other codes focus on health and welfare, including plumbing and mechanical requirements that address issues including sanitation, ventilation, and temperature control. Finally, energy codes are beginning to emerge as federal and state government regulations call for increased energy efficiency in construction and design.

Federal regulations supersede state and local codes and standards, creating uniformity in code application across the country (Harmon & Kennon, 2014). The Federal Register (FR) documents proposed changes to federal regulations for building construction, and once they are passed into law by a ruling agency they are published in the Code of Federal Regulations (CFR). The Energy Policy Act (EPAct) is an example of a federal regulation that applies to the construction and renovation of colleges and universities.

The EPAct establishes regulations for energy efficiency and conservation (Harmon & Kennon, 2014). In higher education, this law primarily impacts the selection and use of approved energy efficient building materials and design standards used to qualify for federal funding and tax deductions. The EPAct is separate from the Leadership in Energy and Environmental Design (LEED) standards. As Harmon and Kennon (2008) explain in an earlier version of their code guide:

> Although the codes, standards, and federal regulations address some sustainability issues such as energy/water efficiency and indoor air quality, they do not address sustainable buildings as a whole… LEED provides a framework for assessing and rating a building's performance and its overall environmental impact. (p. 32)

The LEED programs build upon the minimum requirements in the EPAct law, going

further to create sustainable and energy efficient buildings.

All of the aforementioned codes, standards, and federal regulations constitute

minimum requirements (Harmon & Kennon, 2014). In reality, many of the standards do

not equate to best practice. They simply provide a baseline measure for fire safety, health

and wellbeing, energy, and accessibility requirements. Architects and interior designers

frequently make adaptations or improvements based on experience and recommended

practices. Like the LEED guidelines for sustainability and energy efficiency, there may

be other solutions and alternative guidelines that improve upon the legally required

codes, standards, and regulations. There is no penalty for improving on established

regulations, but there are penalties when those regulations are not met. Even with the

expanded coverage under ADA law, the accessible design standards in higher education

classrooms are incomplete in practice.

Classroom Accessibility in Practice

Because the requirements for ADA compliance leave room for adaptation, many

universities develop guidelines, policies, and procedures for providing individual

accommodation and alternative access to students who declare disabilities as a result

(*2010 ADA standards for accessible design*, 2010; Harmon & Kennon, 2014). At UGA,

for example, the DRC publishes such information on their Web site. Echoing the

exceptions provided by the law, one page states:

> All buildings do not have to be accessible. Existing facilities should be evaluated
>
> to determine the structural changes required to provide access. If feasible, these
>
> changes should be made. The ADA requires that all new facilities be designed

according to the ADA accessibility guidelines. (Disability Resource Center, 2017c, p. 2)

Another page on the DRC Web site outlines the steps in place to help ensure students can register and take classes in accessible locations (Disability Resource Center, 2017b). These include registering with the DRC for services, scheduling an academic advising appointment, utilizing priority registration, reviewing the student's class schedule with their assigned DRC coordinator four weeks prior to classes, and informing their DRC coordinator if class changes occur (Disability Resource Center, 2017b). In the event a class is scheduled in a location determined to be inaccessible to the individual student under ADA law, it is the DRC's responsibility to submit a relocation request with the academic department, campus reservations, or "explore alternative solutions if relocation cannot be achieved due to size of class or other extraneous factors" (Disability Resource Center, 2017b, p. 2).

The strategy for accommodating individual requests on a case-by-case basis is not uncommon, and it is even promoted under the ADA law to ensure reasonable accommodations are arranged to meet students' individual needs (*2010 ADA standards for accessible design*, 2010; Americans with Disabilities Act of 1990, 1990). Institutions are also able to employ a strategy that focuses on individual needs because the number of students reporting disabilities is relatively small, and the proportion of students with disabilities attending U.S. colleges and universities has remained consistent in recent years (U.S. Department of Education & National Center for Education Statistics, 2016). According to the U.S. Department of Education and National Center for Education Statistics (2016), only 11% of undergraduate students reported having a disability under categories for learning disabilities, visual handicap, hard of hearing, deafness, speech

disability, orthopedic handicap, or a health impairment in 2011-12. The DRC reports

lower numbers for The University of Georgia with 4.74% ($N = 1,367$) of undergraduate

students reporting having a disability (E. W. Benson, personal correspondence,

September 4, 2018; The University of Georgia, 2018b).

Providing individual accommodations to a small number of students can create

challenges for individuals and institutions (Fuller, Healey, Bradley, & Hall, 2004; Milic

Babic & Dowling, 2015; Mole, 2012). As previously discussed, the law requires meeting

accessibility standards "to the maximum extent feasible," but if those standards are not

"readily achievable" or cause "undue burden," then institutions are provided an exception

under the law (*2010 ADA standards for accessible design*, 2010). "Undue burden" is

interpreted broadly and exceptions may be achieved by accommodating individuals to the

"maximum extent feasible" by providing students alternative options such as standalone

accessible classroom furniture options or moving classes instead of designing accessible

classrooms (e.g., Disability Resource Center, 2017d; Pettus & Office of Disability

Services, 2012). The broad use of language under the law may create barriers for

institutions seeking to establish standards for accessibility best practices and ongoing

improvements. It may also result in different accommodation practices for students if

standards cannot be established.

Colleges and universities may also choose not to comply with accessibility

requirements, citing budgetary constraints, which is permitted under the law (*2010 ADA*

standards for accessible design, 2010). In one example, Harmon and Kennon (2014)

describe a scenario in which the installation of an assistive listening system was cut from

an auditorium renovation project even though it is required by ADA standards. The

justification used to authorize the decision includes "exceeds the budget for this phase of

the project" (Harmon & Kennon, 2014, p. 524) and the cost of the assistive listening system is "disproportionate to the profit that the owner receives from the auditorium" (Harmon & Kennon, 2014, p. 524). The expectation may have been that few people will require assisted listening devices, and therefore the risk of accessibility compliance enforcement during renovation is low. According to Harmon and Kennon (2014), the cost for retrofitting the auditorium for the assisted listening system was deferred, or there may have been an expectation that an alternative option may become available when the need arises.

When determining responsibility for such decisions to cut accessible requirements from a project, Harmon and Kennon (2014) explain, "The decision to limit the scope of accessibility should be determined by the owner and should be primarily a financial decision, not a design decision. It is typically the owner's responsibility to provide the legal documentation to support this decision" (Harmon & Kennon, 2014, p. 524). Continuing, Harmon and Kennon (2014) say, "What is clear is that the need for compliance is a joint effort between the client and the designer throughout the development of a design project. Documenting all decisions in drawings and other written documents is important" (p. 526).

In practice, classroom accessibility is a legal requirement; however, compliance under the law can be achieved through alternative means besides adopting accessible classroom designs (*2010 ADA standards for accessible design*, 2010; Harmon & Kennon, 2014). The responsibility for compliance resides primarily with the institution, but determining what constitutes an undue burden is ill-defined and enforcement handled on a case-by-case basis (Harmon & Kennon, 2014). As a result, students with disabilities

often encounter individual accommodations in higher education rather than widespread adoption of accessibility best practices.

How classroom accessibility practices impact students with disabilities are not as well documented in recent literature. Expanding the search criteria to include disability or accessibility and classroom design in higher education, literature published by scholarly journals in the last five years returned few results. Literature sourced from Education Research Complete and ERIC databases primarily focused on pedagogical practices, such as Universal Design for Learning in face-to-face and online instruction (Boothe, Lohmann, Donnell, & Hall, 2018; Kraglund-Gauthier, Young, & Kell, 2014). Only three articles directly tied to the impact of accommodations and classroom design for students with disabilities (Morgado Camacho, Lopez-Gavira, & Moriña Díez, 2017; Moriña & Morgado, 2018; Schreuer & Sachs, 2014). The Art & Architecture Source database returned two results that focused on pedagogy for architecture and design students, not the impact of accessibility practices or classroom design on students with disabilities (Holgate, 2015; McDonagh, 2015). Environment Complete returned one article comparing learning outcomes in virtual and physical learning environments (Alfred, Neyens, & Gramopadhye, 2018), and GreenFILE databases returned no results at all.

There were some notable findings in the three relevant articles. For example, Moriña and Morgado (2018) identified several barriers by Spanish university students that warranted adaptation to improve accessibility and inclusivity for students. Barriers included access to buildings and spaces (e.g., no ramps, no elevator, slippery floor material, use of stairs or platforms in classrooms, small spaces), inadequate student furniture, lighting, acoustics (e.g., background noise, instructor microphone use and

malfunctions), access to course materials online (e.g., inaccessible systems or content, use of small fonts), and access and use of technology systems and software.

Schreuer and Sachs (2014) studied the efficacy of accommodations at universities in Israel, and three types of accommodations aligned most with the research interests of this study. They include physical accommodations, academic accommodations, and organizational support. Students in that study reported using physical accommodations when available and found them to be useful, particularly in academic facilities. Similarly, academic accommodations were used when available; most students reported using extended time for assignments and exams. A small percentage (10%) of the students who used academic accommodations reportedly did not find it useful, which Schreuer and Sachs (2014) suggested "may indicate that in some cases this commonly adopted accommodation is provided automatically, without reference to the specific needs of the students and potentially at the expense of other important academic accommodations, such as appropriate teaching methods and materials" (p. 34). With respect to organizational support, Schreuer and Sachs (2014) noted that "students with invisible disabilities are not always willing to disclose their disability lest they be stigmatized" (p. 35). Students with psychological disabilities received fewer services than students with physical or sensory disabilities as a result.

Finally, Morgado Camacho et al. (2017) presented the results of a study in which Spanish students with disabilities shared their perceptions of an ideal university classroom. Examples of themes that emerged included the need for accessible instructional content, assistive and instructional technologies, and additional instructor training. In response, Morgado Camacho et al. (2017) present a series of suggestions for achieving accessibility through practices grounded in Universal Design.

Examples of research focused on the impact of accessibility and accommodation practices on student attitudes, motivation, and achievement were missing from the search results in the review of recent literature. This is significant because students with disabilities are a traditionally marginalized group (Barnes, 2000; Story et al., 1998), and the prevalence of current literature surrounding Universal Design for Learning suggests more attention is given to inclusive classroom practices in the research. A report by the National Center for Special Education Research noted there is considerable research suggesting connections between the psychological factors derived student experiences and achievement (Wagner et al., 2007). These studies tend to focus on adolescents in K-12 settings, not higher education. The lack of current literature on this subject area may be the result of the limited search criteria; however, it may also suggest a gap in the literature and opportunities for further study on the efficacy of accessibility practices and classroom designs.

Determining what constitutes best practice and measuring design effectiveness is not necessarily straightforward, but there are examples of strategies and research that may provide guidance. In the following sub-section, a discussion of the challenges associated with measuring classroom design effectiveness is presented. This discussion is coupled with an example of a multi-year classroom design study intended to demonstrate the types of research needed to boost the body of available literature on the efficacy of classroom design.

Measuring Classroom Design Effectiveness

Measuring the effectiveness of a classroom's design can be framed within the context of the classic Clark and Kozma debates over media comparison studies that attempted to measure the effectiveness of media in instruction (Clark, 1983; Kozma,

1991). Clark argued against the significance of media's impact on learning saying, "The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (Clark, 1983, p. 445). He claimed that the quality of instruction determined the significance of student achievement saying, "Basically, the choice of vehicle might influence the cost or extent of distributing instruction, but only the content of the vehicle can influence achievement" (Clark, 1983, p. 445). Nearly ten years after Clark's groundbreaking article, Kozma (1991) countered this perspective, arguing instead that media can complement cognitive processing capabilities of the individual learner. Further, Kozma argued that media can facilitate operations – physical and cognitive – needed to support learning.

Viewing classroom design as a form of "delivery only" from Clark's (1983) perspective, one could assume student-learning outcomes may be statistically similar between one classroom's design and another. Classroom design, using Clark's own example, may "influence the cost or extent of distributing instruction" (Clark, 1983, p. 445), but only the pedagogy used within the space influences student achievement. Alternatively, the role of the classroom becomes more integrated into the construction of knowledge for the individual learner from Kozma's (1994) perspective. Substituting classroom design for media in this context, Kozma asserted that one should review the "underlying structures and functions of various media that influence [cognitive, affective, or social] processes" (Kozma, 1994, p. 1) by which learning occurs.

In contrast to Clark (1983), there are examples of pedagogies that are not well-suited or easily adapted in any given classroom environment. Beichner et al. (2007) conducted a multi-year study that evaluated the effectiveness of several classroom

designs in conjunction with the instruction of large undergraduate physics classes. After years of teaching classes in a traditional university format with lecture classes coupled with a separate lab period, Beichner et al. (2007) argued in favor using an active learning pedagogical model designed to blend face-to-face lecture and laboratories into a single classroom and class period. They developed the acronym "SCALE-UP" to describe this model: Student-Centered Active Learning Environment with Upside-down Pedagogies.

Beichner et al.'s (2007) study found that lecture halls, individual student desks, and rows of long tables with fixed seats did not adequately support the instructional SCALE-UP activities taking place in the room. The final design selected to best support the pedagogy included an instructor podium in the center of the room and students seated at nine-foot round tables distributed throughout the room (see Figure 2.1 for an example). Beichner et al.'s findings indicated that this layout facilitated large class sizes, group work organized in three groups of three students per table, the use of computers and lab equipment, and easy circulation and classroom management for instructors and teaching assistants.

Figure 2.1. Example of a SCALE-UP classroom. From "Science Learning Center: Technical Help," by the Office of STEM Education, 2018, https://ose.uga.edu/science-learning-center/technical-help/. Copyright [2018] by The University of Georgia. Reprinted with permission.

Beichner et al.'s (2007) research indicates that classroom design played an important role in the success of the SCALE-UP project's pedagogy and, ultimately, student achievement. The data collected from more than 16,000 students over five years comparing both traditional and SCALE-UP settings indicated that students' conceptual understanding and retention of course content increased, failure rates decreased (particularly for women and minorities), and attendance rates improved. These findings align with Kozma's (1991) position, supporting his argument that cognitive, affective, and social processes may be supported by the affordances of media, or in this case, the classroom's design.

The findings from Beichner et al.'s (2007) study support the need for continued research in how classroom designs complement and facilitate teaching and learning. Equally important is the need to review our assumptions about current classroom designs and the barriers that exist for student achievement. This is particularly true for students with disabilities who are regularly provided accommodations to access college and university classrooms and participate in instructional activities. The principles outlined by Universal Design may provide such a framework for practice and research.

<center>Universal Design</center>

Universal Design is defined as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for specialized design" (Story et al., 1998, p. 2). This concept followed a long history of U.S. accessibility and assistive technology reforms, but it drew a clear distinction from those past movements. Instead of accommodations, Universal Design provided a framework for applying user-centered, inclusive design strategies in practice. In this section, the

foundations of Universal Design are discussed, followed by an overview of its application in both physical spaces and learning environments.

Foundations of Universal Design

Universal Design was influenced heavily by the "Barrier-Free" movement of the 1950s (Story et al., 1998). Many veterans returned from World War II disabled, unable to access buildings and, in some cases, unable to find work. In response, veterans' groups pushed for architectural and civil rights reform to ensure individuals with disabilities had equal opportunities and access to buildings, services, and employment under the law. Several bills related to accessibility followed as a result of these political movements and were subsequently enacted into law. These included the Architectural Barriers Act of 1968, Section 504 of the Rehabilitation Act of 1973, the Education for Handicapped Children Act of 1975, the Fair Housing Amendments Act of 1988, the Americans with Disabilities Act of 1990, and the Telecommunications Act of 1996 (Story et al., 1998). These laws addressed a range of issues for people with disabilities including improving building design and access, prohibiting discrimination, ensuring access to public education services, and ensuring the accessible design of telecommunications devices and services.

Support and awareness for rehabilitative and assistive technologies also broadened during this period. The development and improvement of prosthetics and orthotics expanded following World War II (Story et al., 1998). This led to further development of assistive technologies, described as "devices for personal use created specifically to enhance the physical, sensory, and cognitive abilities of people with disabilities and to help them function more independently in environments oblivious to their needs" (Story et al., 1998, p. 10). Assistive technologies focused on meeting a

specific need in a given environment rather than creating or adapting the environment for use by all people (Story et al., 1998). This important distinction led to the development of Universal Design principles, which instead focused on inclusive design standards that benefit all users (Norman, 2013; Story et al., 1998).

The North Carolina State University's Center for Universal Design (CUD), a collaborative group of architects, product designers, engineers, and environmental designers, were the primary champions for this movement (Burgstahler, 2009; Story et al., 1998). They established seven guiding principles around the concept of Universal Design (Story et al., 1998), summarized as follows:

1. Equitable use - this principle emphasizes the importance of design that appeals to and is available for all users, not most, in order to avoid segregation.

2. Flexibility of use - this principle encourages flexibility of choice and adaptability of a design's use.

3. Simple and intuitive use - this principle aims to reduce complexity and build on intuitive and consistent design techniques.

4. Perceptible information - this principle presents options for displaying or communicating information in ways that are legible, perceptible (such as pictorial, verbal, or tactile), or compatible with techniques or devices.

5. Tolerance for error - this principle suggests building in fail-safe features to encourage appropriate or intended use and avoid adverse actions through design or warning messages.

6. Low physical effort - this principle encourages efficient and comfortable design that minimizes repetitive, sustained, or demanding force for operation.

7. Size and space for approach and use - this principle reminds designers to build in appropriate space to see, access, and use a design independently with or without assistive or personal devices.

The CUD encouraged the application of these principles in a broad range of contexts. Common applications include Universal Design for Physical Spaces and Universal Design for Learning (Burgstahler, 2009; Salmen, 2011).

It is important to note that Universal Design is conceptually different from accessible design. As Salmen (2011) explains, "Accessibility is about compliance with regulations that protect a small percentage of the population. Universal Design is about empowering the entire population to reach its potential" (p. 14). These principles and associated guidelines extend beyond the minimum standards established by accessibility laws, and they encourage different ways of thinking about design choices in contexts that include both physical spaces and pedagogical practices.

Universal Design for Physical Spaces

When applied to physical spaces, the seven guiding principles of Universal Design are used to evaluate the physical and perceived impact of an environment's design and features in relation to the intended audience and use (Norman, 2013; Story et al., 1998). For example, a lecture hall is intended to seat large numbers of students, some of whom will have disabilities, for instructional activities. Traditionally, these types of classrooms are designed with tight rows of seats positioned on tiers accessed by steps. The use of steps, among other classroom design features, limits access and use for some individuals with disabilities. Applying a Universal Design lens to evaluate design changes may improve access and use.

An example of applied Universal Design strategies in a lecture hall would be to employ ramps with handrails instead of stairs. This design modification presents a more inclusive design option that supports each of the seven principles from Universal Design. The ramps enable individuals to easily access all areas of a classroom and choose where to sit (i.e., equitable use, flexibility of use, and low physical effort). By design, ramps present a clear path to access the classroom (i.e., simple and intuitive use), and the handrail provides visible and tactile support to aid individuals navigating the ramp's incline (i.e., perceptible information and tolerance for error). Additionally, the ADA defines the design standards for ramps (i.e., size and space for approach and use), and institutions are required to comply with those standards when constructing or renovating classrooms (*2010 ADA standards for accessible design*, 2010).

The application of the seven principles often provides improvements to physical spaces that benefit all users, not just improving accessibility for disabled users. As Burgstahler (2009) explains:

> Making a product or an environment accessible to people with disabilities often benefits others. For example, automatic door openers benefit students, faculty, and staff using walkers and wheelchairs, but also benefit people carrying books and holding babies, as well as elderly citizens. Sidewalk curb cuts, designed to make sidewalks and streets accessible to those using wheelchairs, are often used by students on skateboards, parents with baby strollers, and delivery staff with carts. When television displays in food services, museums, and other public areas are captioned, programming is accessible not only to people who are deaf but also to others who cannot hear the audio in noisy areas. (p. 1)

The example previously described in which ramps with handrails are used in a lecture hall in place of stairs demonstrates this outcome. Ramps with handrails improve access for individuals with disabilities without negatively impacting non-disabled individuals. Further, the use of the ramp requires less physical effort than stairs, making access and use easier for all individuals in the classroom.

Universal Design for Physical Space and the associated guiding principles provide a series of choices to designers and users. It is impossible to plan around an infinite number of design customizations, but as Salmen (2011) describes, "A universally designed campus allows people choices of how they enter buildings, residential accommodations, and options for sitting in classrooms together or separately regardless of their mobility," (p. 16). Through simple design changes, it may be possible to add multiple methods for access and use, building more opportunities for choice in classroom designs than is currently available to its users. It is this concept of building more opportunities for choice that supports the broad application of Universal Design principles in multiple contexts, including learning, which has implications for the intended use of a classroom and the success of the teaching and learning practices that take place therein.

A review of scholarly literature published in the last five years did not return any results on Universal Design for Physical Spaces in higher education across selected databases (i.e., Education Research Complete, Environment Complete, ERIC, GreenFILE, and PsycINFO) or the university's multi search database. Instead, the majority of the literature returned related to Universal Design, classroom design, and higher education focused on Universal Design for Learning, which is discussed in the next sub-section. Extending the search criteria (e.g., date range, keywords, etc.) returned

articles that largely targeted a practitioner audience, providing an overview of Universal

Design principles and best practices based on lessons learned (Burgstahler, 2009;

Heylighen, Van der Linden, & Van Steenwinkel, 2016; Milic Babic & Dowling, 2015;

Salmen, 2011).

Universal Design for Learning

Pedagogical practice is a second context in which the Universal Design principles

are applied. Similar to its application in physical spaces, Universal Design for Learning is

"a research-based set of principles to guide the design of learning environments that are

accessible and effective for all" (Center for Applied Special Technology, 2018a).

Universal Design for Learning seeks to employ teaching and learning strategies that meet

the varied needs and abilities of learners, creating a more inclusive learning environment.

While the seven principles for Universal Design serve as a foundation for

Universal Design for Learning, the Center for Applied Special Technology (CAST)

developed a research-based framework which focuses on three core principles: (1)

provide multiple means of engagement, (2) provide multiple means of representation, and

(3) provide multiple means of expression (Center for Applied Special Technology,

2018a; Meyer, Rose, & Gordon, 2016). These principles are further expanded into nine

guidelines, which offer specific approaches to implementation (for details, see Figure

2.2). The goals of the Universal Design for Learning approach are student-centered,

focused on developing expert learners who are purposeful and motivated, resourceful and

knowledgeable, and strategic and goal-directed (Center for Applied Special Technology,

2018a; Meyer et al., 2016). At each step in the framework, Universal Design of Learning

provides multiple options for learners to engage in learning activities, comprehend

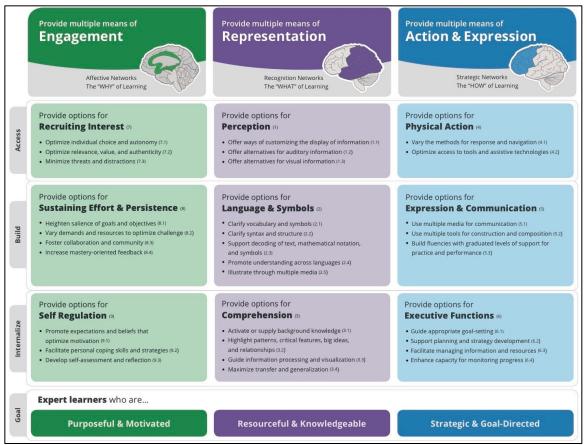presented information, and demonstrate learning.

Provide multiple means of
Engagement
Affective Networks
The "WHY" of Learning

Provide multiple means of
Representation
Recognition Networks
The "WHAT" of Learning

Provide multiple means of
Action & Expression
Strategic Networks
The "HOW" of Learning

Access

Provide options for
Recruiting Interest (7)
- Optimize individual choice and autonomy (7.1)
- Optimize relevance, value, and authenticity (7.2)
- Minimize threats and distractions (7.3)

Provide options for
Perception (1)
- Offer ways of customizing the display of information (1.1)
- Offer alternatives for auditory information (1.2)
- Offer alternatives for visual information (1.3)

Provide options for
Physical Action (4)
- Vary the methods for response and navigation (4.1)
- Optimize access to tools and assistive technologies (4.2)

Build

Provide options for
Sustaining Effort & Persistence (8)
- Heighten salience of goals and objectives (8.1)
- Vary demands and resources to optimize challenge (8.2)
- Foster collaboration and community (8.3)
- Increase mastery-oriented feedback (8.4)

Provide options for
Language & Symbols (2)
- Clarify vocabulary and symbols (2.1)
- Clarify syntax and structure (2.2)
- Support decoding of text, mathematical notation, and symbols (2.3)
- Promote understanding across languages (2.4)
- Illustrate through multiple media (2.5)

Provide options for
Expression & Communication (5)
- Use multiple media for communication (5.1)
- Use multiple tools for construction and composition (5.2)
- Build fluencies with graduated levels of support for practice and performance (5.3)

Internalize

Provide options for
Self Regulation (9)
- Promote expectations and beliefs that optimize motivation (9.1)
- Facilitate personal coping skills and strategies (9.2)
- Develop self-assessment and reflection (9.3)

Provide options for
Comprehension (3)
- Activate or supply background knowledge (3.1)
- Highlight patterns, critical features, big ideas, and relationships (3.2)
- Guide information processing and visualization (3.3)
- Maximize transfer and generalization (3.4)

Provide options for
Executive Functions (6)
- Guide appropriate goal-setting (6.1)
- Support planning and strategy development (6.2)
- Facilitate managing information and resources (6.3)
- Enhance capacity for monitoring progress (6.4)

Goal

Expert learners who are...

| Purposeful & Motivated | Resourceful & Knowledgeable | Strategic & Goal-Directed |

Figure 2.2. Universal Design for Learning guidelines. From "Downloads" by Center for Applied Special Technology (CAST), 2018, http://udlguidelines.cast.org/more/downloads. Copyright [2018] by CAST. Reprinted with permission.

There are a number of practical examples of applied Universal Design for Learning in a higher education context (Boothe et al., 2018; Center for Applied Special Technology, 2018a; Meyer et al., 2016). Using a typical instructional module as an example, Universal Design for Learning may help support student engagement and learning. Instructional modules are often structured with an introduction to a given topic (e.g., reading, lecture, etc.), an activity for practice (e.g., homework assignments, project work, etc.), and concluded with an assessment (e.g., test, written paper, project). Applying a Universal Design for Learning lens to an instructional module in this format, strategies for developing engagement, representation, and action and expression might

include a connection to authentic or real world problems (i.e., engagement), varied

content choices (e.g., readings, lecture, captioned video, etc.) introducing subject matter

(i.e., representation), scaffolded practice activities that align outcomes to measures of

assessment (i.e., action), and provide choices (e.g., papers, tests, or project work) for

assessing learning (i.e., expression).

There has been considerable peer reviewed research published in the last five

years on Universal Design for Learning. Within the context of this study's literature

review, a search for disability or accessibility and classroom design in higher education

returned several results ($n < 50$) related to Universal Design for Learning. The focus of

the literature centered on applications in specific contexts such as face-to-face learning

environments, online learning environments, and subject-specific applications (Boothe et

al., 2018; Flagg-Williams & Bokhorst-Heng, 2016; Kraglund-Gauthier et al., 2014).

Given the potential for highly varied instructional strategies, it is important that

classrooms are designed to accommodate and support a range of potential instructional

methods, technologies, and activities used in support of Universal Design for Learning.

Reflecting on the example of a lecture hall, a common classroom design in higher

education, it is difficult to imagine the features of such a room supporting authentic, real-

world learning that comes from engaged, hands-on, or group work activities. What a

classroom *affords* a learner is a key component in this concept of Universal Design,

whether for physical spaces or learning, and it is the theoretical foundations related to

affordances that drives this underlying component in Universal Design.

Theory of Affordances

The Theory of Affordances provides the theoretical underpinnings for Universal

Design concepts. In this section, the early development of the Theory of Affordances is

discussed. This is followed by updated interpretations of affordances and adaptations for assessing designs.

Gibson's Theory of Affordances

In 1979, environmental psychologist James J. Gibson published the first edition of his seminal work *The Ecological Approach to Visual Perception*. In it, he presented the Theory of Affordances, which he is credited with developing and naming. The theory considered the relationship between an individual's perceptions, the environment, and the resulting actions or behaviors. According to Gibson (2015), "the *affordances* [author's emphasis] of the environment are what it *offers* the animal, what it provides or furnishes, either for good or for ill" (p. 119). He explained:

> An important fact about the affordances of the environment is that they are in a sense objective, real, and physical, unlike values and meanings, which are often supposed to be subjective, phenomenal, and mental. But, actually, an affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behavior. It is both physical and psychical, yet neither. An affordance points both ways, to the environment and to the observer. (p. 121)

Gibson's concept of affordance was derived from Gestalt psychology's concepts about perception; however, he explained a key differentiating factor was that the affordance of an object does not change as the observer changes. Instead, he declared, "An affordance is not bestowed upon an object by a need of an observer and his act of perceiving it. The object offers what it does because it is what it is" (Gibson, 2015, p. 129). It was this concept of "direct perception," the act of looking at the given environment to interpret

information about its affordances, that was the focus of much of Gibson's research (Gibson, 2015).

Determining an object's affordance is key to learning. In Gibson's view, objects can have both positive and negative affordances with reference to the observer (e.g., a knife is a tool that can help individuals cut food, but it can also be used to do harm). He also explained that misinformation can create confusion in determining an object's affordance (e.g., a closed glass door can be mistaken for an open doorway). This distinction that objects inherently contain affordances and that individuals can directly perceive those affordances via sensory cues drew criticism from other researchers who believed the affordances must be interpreted and understood through a cognitive process. This is an important distinction, particularly for researchers and practitioners in design-based fields, as it changes the lens through which a design is evaluated.

Norman's Fundamental Principles of Interaction

Donald Norman is one example of a researcher who criticized Gibson's notion of direct perception. Norman is an electrical engineer turned cognitive psychologist whose work is credited with expanding on Gibson's Theory of Affordances (Norman, 1999, 2008, 2013). Norman agreed with Gibson that affordances exist whether or not they are visible; however, he took a cognitive psychology perspective regarding visual perception (Norman, 2013). Norman believed that an individual cannot directly perceive the affordances of an object, rather the brain has to process information that is viewed to interpret and make sense of the object and its affordances. This perspective is the foundation of Norman's call for improvements in design and user experience practices.

Norman (1988) criticized overly complicated and unintuitive designs of everyday objects such as doors, appliances, and software applications. He shared these views in his

seminal work *The Psychology of Everyday Things*, later republished in 1990 under the title of *The Design of Everyday Things*. In this book, he spoke first hand of his experience as an engineer, designing products that made logical sense to him as the designer but that turned out to be unintuitive for the end users (Norman, 2013). These experiences resulted in the development of Norman's "Fundamental Principles of Interaction," providing a framework for designers seeking more user-friendly outcomes.

In later editions of *The Design of Everyday Things*, Norman (2013) advocates for his preferred approach to design, called user-centered or human-centered design. He describes it as "an approach that puts human needs, capabilities, and behavior first, then designs to accommodate those needs, capabilities, and ways of behaving" (Norman, 2013, p. 8). In support of the user-centered design approach, Norman presents five "Fundamental Principles of Interaction" to promote good design:

1. Perceived affordance - this is the term Norman assigns to Gibson's definition of affordances. These are the physical or visual characteristics of an object, and "what actions the user perceives to be possible" (Norman, 1999, p. 39) based on those characteristics.

2. Signifiers - these are the sensory cues (usually visual or auditory) that communicate the designer's intended action to the user. An example of a signifier is a "PUSH" sign next to a door handle.

3. Mapping - this is the physical connection between two actions, such as rotating a steering wheel and turning a vehicle in the same direction as the steering wheel's rotation.

4. Feedback - this communicates the results of an action to the user, such as a beep or haptic response when pressing a button on a cell phone.

5. Conceptual models - these explain how something works in very simple terms or diagrams, such as folder and file icons on the desktop of a computer.

A supporter of Universal Design (Norman, 2013), Norman's principles build off Universal Design concepts to address common gaps in design thinking and implementation of designs.

Several examples of current literature focused on affordances and classroom design in higher education focus on pedagogical practices and "next generation" learning spaces (Crisp, 2014; Gelan et al., 2018; Ling & Fraser, 2014). For example, Crisp (2014) the pedagogical trend toward gamification of learning and implications for practice in physical, online, and massive open online course (MOOC) learning environments. Use of the term "affordance" in the research is often synonymous with "capabilities" and used in contrast to the term "limitations," as is the case in the Gelan et al. (2018) study on learning analytics for computer-assisted language learning. Discussions about accessibility and Universal Design for Physical Spaces were not present in the review of the literature on affordances.

<div align="center">Conclusion</div>

The literature outlining current classroom designs, requirements for compliance, and common practice in accessibility compliance, coupled with notable omissions and lack of literature in some topic-specific areas, underscores the need for assessing classroom designs for affordances that are more inclusive. Conducting research and implementing practices that draw on concepts from Universal Design and derive from theoretical underpinnings of the Theory of Affordances may present opportunities for improved classroom designs. For the purpose of this study, which aims to explore the perspectives of undergraduate student served by the UGA DRC on how the physical

classroom space impacts learning for students with disabilities, the literature provides a

foundation for contextualizing the study's results.

CHAPTER 3

METHODOLOGY

Introduction

The purpose of this study was to explore the perspectives of undergraduate students served by the UGA DRC on how the physical classroom space impacts learning for students with disabilities. The driving research questions for the study included:

1. To what extent do students perceive the design of a classroom space impacts their learning experience?

2. What aspects of classroom design do students identify as impacting their learning experience?

3. How do these student-identified aspects of classroom design impact their perceptions of their learning experience?

An explanatory mixed methods design was used for this case study, drawing inferences about collected quantitative data through in-depth qualitative data analysis. Methodological details for the study are provided following a description of the pilot study conducted in Spring 2018.

Pilot Study

The research study described in Chapter 3 is based on a pilot study conducted in collaboration with the University of Georgia's (UGA) Disability Resource Center (DRC) in Spring 2018. The pilot study helped to refine the final study's design and logistics prior to launch. This included testing and revising the survey and the focus group protocol and collecting sample survey and focus group data.

Participants recruited and selected for the pilot study were undergraduate members of the Disability Resource Center's (DRC) Speakers Bureau ($N = 40$), a volunteer student advocacy group that speaks to faculty, staff, students, and UGA campus organizations about DRC services and student needs. Email templates recruiting voluntary participation were submitted to DRC staff for distribution to Speakers Bureau members (see Appendices A, B, and C). The eligible members were invited to participate in each of the three phases of the pilot study: (1) a preliminary focus group, (2) survey distribution, and (3) follow-up focus groups.

Preliminary Focus Group

During the preliminary focus group, participants ($n = 5$) were asked to provide feedback on a draft version of the survey (see Appendix D). Participants completed the survey prior to attending the hour-long focus group session to allow adequate time to discuss questions regarding the survey's structure and content (see Appendices E). Collected data from the first phase of the pilot included draft survey responses, audio recordings, and written notes.

In the pilot study version of the survey, participants were presented with a Likert scale measuring the impact of six high-level categories of classroom design features on their learning experiences: (1) Access, (2) Acoustics, (3) Furniture, (4) Lighting, (5) Lines of Sight, and (6) Temperature. Only participants that selected a "4 - High Impact" or "5 - Most Impact" on the Likert scale for a given category were offered follow-up questions requesting feedback on ideal classroom design features related to those categories.

Results from the preliminary focus group recommended changes to the survey, which was revised and delivered to participants in the next phase of the pilot study (see

Appendices F). For example, preliminary focus group participants suggested segmenting each category into its own page on the survey, presenting the Likert scale for that category to measure impact, and listing the ideal classroom features related to that category below the Likert scale for survey participants to check all that apply. The preliminary focus group participants reasoned that survey participants may not associate the terminology presented in the Likert scale with all the potential classroom design features that support student learning experiences. Additionally, they suggested that even if a particular category did not strongly impact a student based on their disability, presenting the choices for ideal classroom design features that support learning would generate more data for the second research question.

Participants also recommended expanding the list of disability options in the demographics section of the survey. Although the disability categories listed on the survey aligned with the classifications used by the DRC, participants found them confusing, limiting, and out of alignment with standard self-disclosure forms. Instead, participants suggested using the disability self-disclosure form from LinkedIn, a popular job posting and recruitment website, or a similar resource to update and expand disability categories. A participant submitted a screenshot of a sample form via email following the preliminary focus group (see Figure 3.1); this served as the basis for revisions to the disability categories used in the revised version of the survey.

Figure 3.1. Sample disability categories.

Finally, the preliminary focus group participants made a number of recommended additions to the options for ideal classroom design features in select categories. Most of the changes expanded the choice options in the survey to include desired ideal classroom features based on participants' shared experiences. For temperature, however, participants suggested using descriptors indicating what a temperature range might "feel like" for students who may not differentiate between the listed numerical ranges. These changes are summarized in Table 3.1.

Table 3.1

Modifications to Ideal Classroom Design Features by Category

Category	Summary of Modifications
Access	Adding the following options: • Ability to access all areas of the classroom • Ability to sit in any seat in a classroom
Acoustics	Adding the following options: • Use of closed captioning services • Access for notetaking services
Furniture	No changes
Lighting	Adding the following options: • Natural lighting from windows • Shades in rooms to partially block natural lighting • Blackout shades in rooms to fully block out natural lighting
Lines of Sight	Adding the following options: • Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor) • Using the technology in the room to facilitate class activities (e.g., presentation system, document camera, interactive tablet/touch screen for annotations, etc.) • Incorporating student furniture that facilitates movement (e.g., adjustable chairs, chairs that swivel, chairs on casters, etc.)
Temperature	Add "feels like" descriptors for each temperature range

Survey and Follow-up Focus Groups

Following the preliminary focus group, the recruitment email and a link to the revised survey (see Appendices B and F) were submitted to DRC staff for distribution to Speakers Bureau members ($N = 40$) for the next step in the pilot study data collection. Survey responses were collected online for a period of 10 days; nine ($n = 9$) survey responses were submitted.

Three follow-up focus group sessions were scheduled the week after the revised survey closed to review the collected data with participants and discuss participants' experiences. An email template was submitted to DRC staff for recruitment purposes and

was delivered to Speakers Bureau members (see Appendix C). Each session was scheduled to last one hour, and the sessions were scheduled on different days and times to try to accommodate varying schedules. Two ($n = 2$) members attended separate follow-up focus group sessions, and individual interview data was collected as a result using the same semi-structured interview question prompts and handout (see Appendices G and H).

While some insights into classroom design and the impact on student learning experiences were gleaned from the pilot study, participation rates in the survey and follow-up focus group sessions were too low to use for formal analysis. That said, revisions to the survey and to the focus group questions were informed by the pilot study. The most significant change was logistical, resulting in the delivery of the final survey to all students registered with the DRC ($N = 1,367$). In the following sections, I review the design of the final study and outline changes made in collaboration with the DRC that resulted in higher participation rates following the pilot study.

Research Design

To answer the research questions, I conducted a case study using an explanatory sequential mixed methods design in Fall 2018. Described simply, "A *case study* [author's emphasis] is an in-depth description and analysis of a bounded system" (Merriam & Tisdell, 2016, p. 37). The study focused on undergraduate students at UGA (the bounded system) who have formally declared a disability and are served by the university's DRC. The unit of analysis for the case was the responses of participants to specific questions in the survey and focus groups. This extended the scope of participation to include all undergraduate students served by the DRC ($N = 1,367$), no longer limiting participation to the undergraduate members of the DRC's Speakers Bureau ($N = 53$ for Fall 2018 semester) as it was during the pilot study. Additionally, the case focused on common

classroom design features found across large, general assignment classrooms such as lecture halls with stadium-style seating, general seminar rooms with tables or desks, and SCALE-UP or Active Learning classrooms with tables for small group work.

As indicated earlier, the case study followed an explanatory sequential mixed methods design, collecting both quantitative and qualitative data for analysis outlined in Figure 3.2. Described by Creswell (2015), "the intent of the explanatory sequential design is to begin with a quantitative strand and then conduct a second qualitative strand to explain the quantitative results" (p. 38). As such, the study was conducted in two phases: (1) survey distribution and (2) follow-up focus groups. Quantitative data were collected from participant responses to an online survey, and qualitative data was collected primarily from two focus group sessions following the survey's distribution and preliminary analysis. Additional qualitative data were collected from optional open-ended survey questions and used to support data analysis.
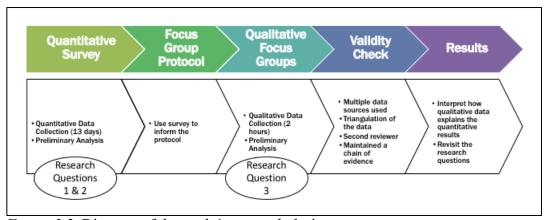
Figure 3.2. Diagram of the study's research design.

Site Selection

The study investigated general assignment classroom designs, such as lecture halls, rooms with tables and desks, and SCALE-UP or active learning classrooms, found in most colleges and universities. In large universities, these classrooms are commonly

used by large populations of undergraduate students. While graduate students may use these rooms, class sizes tend to be smaller than undergraduate classes and access to the more specialized classroom or research space is common. To ensure a focus on these general assignment classroom designs and limit variables associated with specialized classroom and research spaces, site selection was limited to universities with large numbers of general assignment classrooms and undergraduate student populations.

Although other universities were considered, UGA was ultimately selected as the research site for this study for several reasons. First, the site met the above-listed criteria, housing more than 350 general assignment classrooms used by a large undergraduate population (Center for Teaching and Learning, 2017; The University of Georgia, 2018a, 2018b). The university also has an active Disability Resource Center for students, and the number of undergraduate students served by their office ($N = 1,367$) provided a large study population. Finally, my employment at the university enabled a level of access within the site that would take much longer to develop at other institutions. As an employee, I was familiar with the campus and many of its classrooms, policies, and practices. Additionally, I had existing professional relationships with individuals and groups associated with the study's participant recruitment and data collection, including staff in the DRC.

Having these working relationships in place ensured a fundamental level of trust and understanding of site-specific context and culture. The DRC not only trusted me to work directly with their students, but they were active supporters of this research. They were interested in learning more about improving their services and about student experiences with classrooms on campus, and the results of this study could provide more

insight into these areas of interest. The DRC partnered with me to provide documents and data used primarily for validity checks, and they assisted with participant recruitment.

<center>Participant Recruitment and Selection</center>

With the support of the DRC, the survey and focus group recruitment was opened to include all undergraduate students at UGA served by the DRC ($N = 1,367$) in an effort to increase participation rates and disability representation (see Table 3.2 for population details). Additionally, the DRC offered two key incentives for participation in the final study: (1) they provided "Experiential Learning" credits for Speakers Bureau members who participated in the survey and/or the follow-up focus group, and (2) they provided free food for all attendees of the first focus group session. To streamline scheduling and encourage participation, the first follow-up focus group was scheduled to take place immediately after the first Speakers Bureau meeting of the year. The online survey was scheduled to launch two and a half weeks prior to the Speakers Bureau meeting and focus group session, just after the first week of classes.

Table 3.2

Fall 2018 Primary Disability Groups for Undergraduate Students Served by the DRC

Primary Disability Group	Visibility of the Disability	Active Undergraduate Students Served (*n*)	Percentage (%)
ADHD	Invisible	394	28.82%
Psychological	Invisible	293	21.43%
Learning Disabilities	Invisible	267	19.53%
Systemic: Chronic Health	Invisible	160	11.70%
Systemic: Neurological	Invisible	78	5.71%
Brain Injuries	Invisible	46	3.37%
Deaf and Hard of Hearing	Visible	35	2.56%
Visual Disabilities	Visible	25	1.83%
Systemic: Muscular Skeletal	Visible	25	1.83%
Autism Spectrum Disorders	Invisible	21	1.54%

Table 3.2 (continued)			
Other	N/A	9	0.66%
Communication Disorders	Visible	7	0.51%
Mobility Impairment	Visible	7	0.51%

Participant recruitment for the final study modeled after the pilot study. The email templates were modified to open recruitment and selection to all UGA undergraduate students with a declared disability and served by the DRC (see Appendix I). A copy of the IRB-approved consent form along with a flyer inviting participants to join the first focus group was attached to the survey recruitment email (see Appendices J and K). These templates were submitted to DRC staff for distribution to all students served by their office. All students registered with the DRC were invited to participate in both the online survey and the follow-up focus group session.

A second focus group was scheduled later in the semester in response to the preliminary analysis of the survey and data from the first focus group. Disability representation in the survey and focus group were disproportionate to one another and to the overall population (see Figure 3.3), so a second focus group was formed to target more focus group participation from students with invisible disabilities represented by the survey data. A revised email template was submitted to the DRC for distribution to members of the Speakers Bureau ($N = 53$) to recruit participants representing the targeted demographics (see Appendix L).
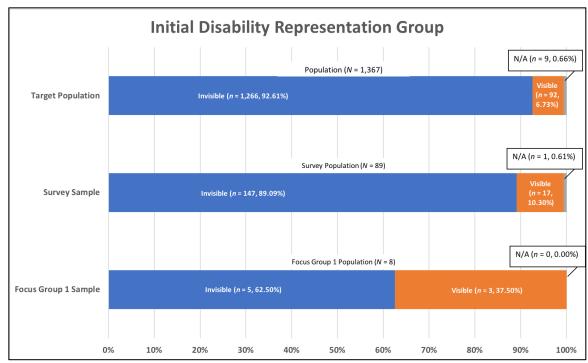
Figure 3.3. Initial disability representation comparison. Disability representation comparison of the DRC undergraduate population, survey participants, and participants in the first focus group.

To increase advertising exposure to eligible participants and increase participation rates, the email template for the second focus group and the IRB-approved consent form were also shared with faculty and staff contacts in the UGA Honors Program and College of Education. The total number of potential participants recruited through these contacts is unknown, but the emails targeted eligible undergraduate students from the UGA Honors Program, undergraduate classes offered by the Career and Information Studies department, and undergraduate classes offered by the Communication Sciences and Special Education department. To maintain parity with the first focus group, experiential learning credit for Speakers Bureau members and free food were offered for participation in the second focus group. The combined focus groups resulted in populations that more closely represented the survey and DRC undergraduate populations (see Figure 3.4).
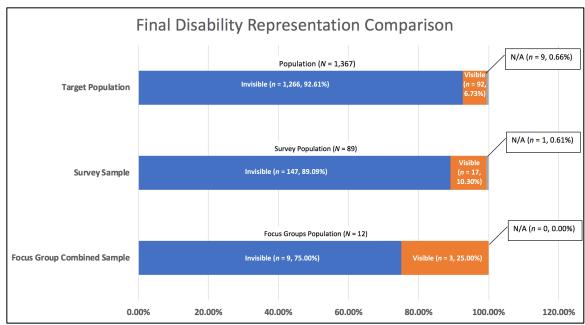
Final Disability Representation Comparison

Target Population
Population (N = 1,367)
Invisible (*n* = 1,266, 92.61%)
Visible (*n* = 92, 6.73%)
N/A (*n* = 9, 0.66%)

Survey Sample
Survey Population (N = 89)
Invisible (*n* = 147, 89.09%)
Visible (*n* = 17, 10.30%)
N/A (*n* = 1, 0.61%)

Focus Group Combined Sample
Focus Groups Population (N = 12)
Invisible (*n* = 9, 75.00%)
Visible (*n* = 3, 25.00%)
N/A (*n* = 0, 0.00%)

0.00% 20.00% 40.00% 60.00% 80.00% 100.00% 120.00%

Figure 3.4. Final disability representation comparison. Disability representation comparison for DRC undergraduate population, survey participants, and focus group participants.

Data Collection Instruments

Multiple methods were used to collect data for this study. Quantitative survey data and qualitative focus group data were the primary data sources; however, qualitative data from open-ended survey questions were also included during the analysis process. These methods and the instruments used to collect data are described in this section.

Survey Data

Quantitative data were collected using the revised online survey developed in collaboration with the DRC's Speakers Bureau during the pilot study (see Appendix F). Qualtrics, an online survey tool, was used to develop and distribute the online survey. The collected survey data aimed to answer the first two research questions: (1) exploring to what extent students believe classroom design features impact learning experience, and (2) indexing what classroom design features students identify as supporting their learning experience.

Likert scale questions were used to measure to what extent students believed classroom design features impacted their learning. These questions were quantified on the following scale: least impact (weight = 1), some impact (weight = 2), moderate impact (weight = 3), high impact (weight = 4). Because participants were required to choose one option, IRB approval required the addition of an "N/A" (not applicable) choice.

Multiple choice questions were used to count classroom design features that students identified as supporting their learning. Choice options varied by category and were developed in collaboration with pilot study participants during the preliminary focus group. Choice selections were optional; survey participants could select as many options as desired or make no selections at all. They also had the option to select "Other" as a choice and write-in a response.

In addition to the question types listed above, there were two open-ended questions included at the end of the survey. These two questions were optional. Responses collected in these questions were analyzed separately from the quantitative data analysis, but included in the study's qualitative data analysis.

Participants were emailed a link to a copy of the revised online survey developed following the recommended changes of the preliminary focus group. This ensured the data collected in the study were stored separately from the pilot study data. The survey was open for 13 days to collect participant responses.

Focus Group Data

Qualitative data were collected during two focus group sessions following the conclusion of the survey. The focus groups were scheduled for one hour in duration on separate dates. ScreenFlow screencasting software, digital audio recorders, and notetakers were used to collect focus group data. ScreenFlow recorded the focus group session's

PowerPoint presentation and audio, and it was used to mix the audio levels prior to transcription. Digital audio recorders were used as backup recording devices and to aid with audio mixing and transcription. Notetakers were also used to document responses and themes that emerged during the focus group session. The notes were used to check the validity of the data and preliminary analysis of the data.

The focus groups modeled after the pilot study's follow-up focus group sessions, reviewing the collected survey data, verifying the accuracy of the results, and discussing participants' experiences using a semi-structured interview protocol to explain the results. The focus groups also provided a forum to more deeply explore the issues that students served by the DRC face from a classroom design perspective. The collected qualitative data aimed to answer the third research question, explaining the perceptions of how the identified classroom design features impact students' learning experience.

During the focus group, participants were provided a handout listing the survey results for each of the six high-level categories of classroom design features (see Appendix M). The presented results included the cumulative response counts for both Likert scale and features supporting students' learning in each category. A summary of the overall survey results was incorporated into a PowerPoint presentation, presenting the impact of classroom design features and the ideal classroom design features as indicated by the survey results (see Appendix N). The semi-structured interview protocol used during the focus groups modeled after the pilot study, but it was also informed by the survey results and adapted as needed based on the conversation with participants.

Analysis Procedures

Data Organization

Throughout the data collection and analysis process, I created what Yin (2014) refers to as a "case study database" by organizing collected quantitative and qualitative data in ATLAS.ti version 8.3.1 software for Mac OS X. Before importing files into ATLAS.ti, original copies of the collected data files were retained in a password protected folder on my computer as an archival copy until the completion of the study. These archived files were named using a standard naming convention that included the collection date and a brief description of the data source (e.g., "2018-09-02-FS-survey_data_raw.csv"). The abbreviations "PS" and "FS" were used in the file names to distinguish between data collected for the pilot study and the final study. Working copies of data files were kept in a separate, password protected folder on my computer until they could be imported into ATLAS.ti; these working copies were imported as "Documents" into ATLAS.ti.

The names for the ATLAS.ti Documents used the standardized naming convention described above. The comments field was used to summarize the contents of each document. The use of Document name and description was intended to aid in identifying the file and the contents therein, both for my own use and for other researchers who reviewed the collected data. See Figure 3.5 for an example of the naming standard for Documents in ATLAS.ti.
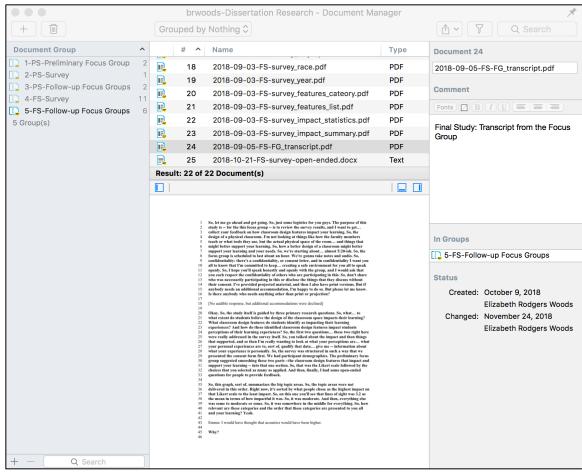
Figure 3.5. Documents organized in ATLAS.ti using comment feature descriptions.

Documents were organized into "Document Groups" in ATLAS.ti. Document Groups are analogous to folders used to contain and organize files; the purpose of the Document Groups was to collect and organize Documents within ATLAS.ti for easy retrieval and to aid in the analysis process. Document Group names described the order of events and types of documents included in the group (e.g., "1-PS-Preliminary Focus Group"), and I used the comments field to summarize the contents of the group (e.g., "Pilot Study Preliminary Focus Group files"). See Figure 3.6 for an example of Document Groups in ATLAS.ti.
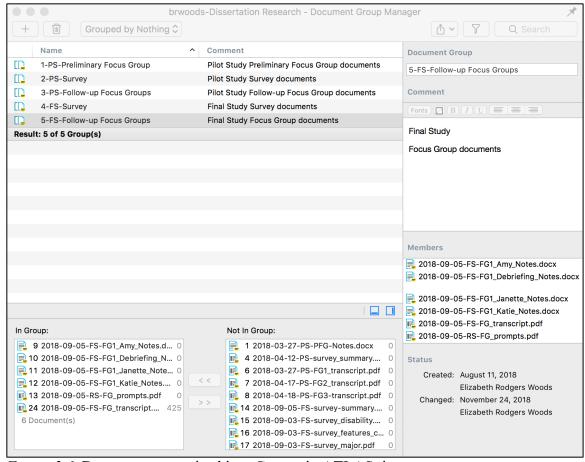
Figure 3.6. Documents organized into Groups in ATLAS.ti.

Similarly, codes developed during qualitative analysis were documented in ATLAS.ti and stored in the Code Manager. Codes were given descriptive names (e.g., "Feature: Acoustics"), and the comment field provided a more detailed description (e.g., "Discussion related to acoustics in classrooms"). Codes groups were also used to organize codes to aid with retrieval and analysis. See examples of codes, code descriptions, and code groups in Figure 3.7. A complete list of the codes used for the study is located in Appendix O.
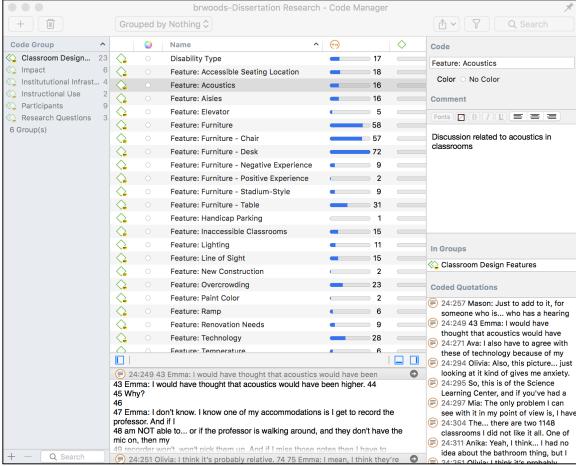
Figure 3.7. Example of Codes and Code Groups in the ATLAS.ti Code Manager.

Quantitative Data Analysis

The quantitative survey data were downloaded from Qualtrics into a comma separated value (.csv) spreadsheet format. After saving an archive copy, a working copy of the spreadsheet was created and saved into an Excel spreadsheet format (.xlsx) using Microsoft Excel version 16.17 for Mac OS X. The data were first analyzed in Excel before being converted to an Adobe Portable Document Format (.pdf) and imported into ATLAS.ti version 8.3.1.

There were 115 total survey submissions; however, a subset of these submissions ($N = 89$) was included in the study's analysis. The criteria for excluding quantitative data from analysis were as follows: (1) the participant self-declared a graduate major or

professional degree, or (2) the survey data was incomplete because the participant did not complete all Likert scale questions measuring the impact of classroom design features on their learning experience. If a student declared a graduate-level major or professional degree, this made them ineligible for participation because the study limited participation to *undergraduate* students only. Additionally, there were several students who partially completed the survey. Most did not go beyond the demographics page, but some completed the survey up to a point and might not have clicked through the end to submit their responses.

By including any survey that completed the Likert scale responses ($N = 89$), I was able to analyze all required questions and ensure a consistent participation rate. Participant surveys were included in the analysis if a participant selected "N/A" (not applicable) on the Likert scale or did not select an optional choice identifying features that support their learning for each category. Whether or not a participant completed the final two questions of the survey after the Likert scale questions were deemed inconsequential in terms of inclusion of the data for analysis; both questions were open-ended and optional. Similarly, if a participant clicked through to the last page of the survey but did not submit the survey at the end, their responses were included in the analysis so long as the participant completed the required Likert scale questions; the responses remained accessible via Qualtrics.

To analyze the survey data, the results were organized into eight tabs in a Microsoft Excel spreadsheet labeled as follows: (1) Gender, (2) Race, (3) Major, (4) Year in School, (5) Disabilities, (6) Impact by Category, (7) Features by Category, and (8) Features Supporting Learning (see Figure 3.8 for an example). The first five tabs were used to organize the self-disclosed participant demographics data collected at the

beginning of the survey (i.e., gender, race, major, year in school, and self-declared disabilities). Within each of these five tabs, each response choice, the count each response choice received, and the percentage each choice received out of the total number of responses were listed. Response categories were then sorted in descending order, from largest count to smallest. The counts were then color-coded using the "Conditional Formatting" feature in Excel and selecting "Color Scales" and the "Red - Yellow - Green" color scale option (see Figure 3.9 for an example).

Figure 3.8. Example of data organized into eight tabs.

Figure 3.9. Example of survey results sorted and color-coded for analysis.

The "Impact by Category" tab was used to organize the data collected in each of the six Likert scale questions measuring the impact of specific classroom design features categories on students' learning experiences (i.e., access, acoustics, furniture, lighting, lines of sight, and temperature). For each category, the weight, the count, and the percentage each choice received out of the total number of responses were listed for each Likert scale response choice. The weight and response count were then used to calculate the weighted average, standard deviation, and variance for the classroom design feature category. Response choice "N/A" were counted, but excluded from the weighted average, standard deviation, and variance calculations. Response categories were sorted in descending order and color-coded using the "Conditional Formatting" feature in Excel previously described.

Similarly, the "Features by Category" tab was used to organize collected data about classroom design features that participants reported as supporting their learning experiences. For each classroom design feature category, each response choice, the count, and the percentage were listed. Some participants selected "other" as a response choice, and they were given the option to write in a response. Those write-in responses were reviewed, categorized, and incorporated as added response choices for each respective category with the prefix "Other:" and a description of the write-in responses. Responses within each category were then sorted in descending order, from largest count to smallest, and color-coded as previously described.

Classroom design features that support learning were also compared across all categories. The "Features Supporting Learning" tab was used to organize this data. All responses were consolidated into a single table beginning with the classroom design feature category and followed by the response choice description, response count, and

percentage each choice received out of the total number of responses. As in other tabs, responses were sorted in descending order, from largest response count to smallest, and color-coded. Break lines were added to show the top 50% and the overall top responses ($n > 30$).

Qualitative Data Analysis

Qualitative data from focus group transcripts were generated using a multi-step process prior to analysis. First, ScreenFlow was used to mix audio levels for the focus group recordings and export each recording to a MPEG-4 (.mp4) video file. The files were uploaded to YouTube as "private" files (i.e., only visible to the account holder) in order to generate preliminary transcripts using YouTube's free, automatic captioning feature (YouTube, 2018).

The preliminary transcripts were downloaded from YouTube and saved into a text (.txt) file format. The content was copied and pasted into a Word document format (.docx) using Microsoft Word version 16.17 for Mac OS X. The preliminary transcripts were reviewed using the audio recording and corrected manually for transcription errors and to add pseudonyms. Line numbers were added to help facilitate data identification during analysis. The final transcript was converted to an Adobe Portable Document Format (.pdf), archived, and a copy imported into ATLAS.ti version 8.3.1 for analysis.

The transcripts from both focus groups included responses from a total of 12 participants. Eight participants attended the first focus group, and four participants attended the second focus group. All focus group participants ($N = 12$) spoke at least one time during each session. Focus group data included for analysis were transcribed statements recorded between the researcher's first question on the focus group protocol and the researcher's concluding remarks following the last question on the protocol (see

Appendix N). While the time stamps varied slightly between each recording, this ensured parity between discussion prompts across both focus groups.

Qualitative data from the survey's open-ended questions were downloaded from Qualtrics and saved in an Adobe Portable Document Format (.pdf). An archive copy was retained in a password protected folder for the duration of the study. Working copies were imported into ATLAS.ti for analysis.

To analyze the qualitative data in ATLAS.ti, preliminary codes were developed using an inductive process while reading each document. These codes were reviewed and modified in collaboration with Dr. Janette Hill, who served as a second reviewer, for consistency and alignment with the research questions and notetaker notes. The modified codes were then used during a second, deductive analysis of the data. The list of codes was exported into a Codebook, included as Appendix O.

<div align="center">Validity, Reliability, and Trustworthiness</div>

The study was guided by a series of methodological strategies and ethical considerations intended to bolster the trustworthiness of the data collected, analyzed, and presented. Each strategic approach was different and intended to challenge the data from a different perspective, building what Merriam and Tisdell (2016) refer to as "methodological rigor" into the study's design. In this section, I outline how several commonly used research strategies were applied in the context of this study. I also describe how they promoted the study's validity, reliability, and trustworthiness.

Diversity of the Data

The data collected for this study used multiple collection methods and recruited participants from a diverse population. According to Merriam and Tisdell (2016), this strategy of maximizing the variation of a study's population allows "for a greater range of

application of the findings by consumers of the research" (p. 258). The survey and focus groups all contributed data sets from multiple perspectives.

The survey was distributed to a broad base of participants registered with the DRC ($N = 1,367$) representing a range of demographics, including gender, race, year in school, major, and declared disabilities. This recruitment strategy supported the collection of a diverse set of responses in proportion to the overall population and may support the transferability of the study's findings to other similar cases or contexts. A sample size greater than 30 participants is generally accepted under the central limit theorem for quantitative results (Field, 2013; Institute for Digital Research and Education, 2018); a response rate of 2.20% would, therefore, have provided a statistically acceptable sample. The study targeted a higher response rate of 5.00% to further strengthen the statistical significance of the quantitative results and exceeded that number with a response rate of 6.51%.

Additionally, the focus groups yielded a twelve-person subset of the overall study's population. Participants represented a diverse cross-section that was roughly proportional to both the DRC's undergraduate population and the survey's population. Although focus group participants were not representative of all users or groups, the in-depth feedback they shared gave a more balanced voice to experiences for all users. This provided an opportunity to challenge the survey data and contextualize survey data as experienced by participants — particularly those whose disabilities fall in the statistical margins of the survey.

Member Checks

Member checks were used during the focus group session to ensure participant responses were recorded accurately and to validate preliminary findings. Throughout the

focus group session, I asked clarifying questions such as, "Am I correct in understanding…?" or "Am I hearing you correctly…?" This allowed participants to an opportunity to confirm, clarify, or make corrections accordingly.

Peer Review

Peer review was used following the focus group sessions. During the focus groups, audio recordings and two notetakers were used to collect data. Notetakers were asked to stay for 30 minutes after the focus group ended to discuss high-level themes they felt emerged from the session. I summarized these themes into a third note and referred to it during my analysis of the transcript data. The peer review process served as an opportunity to ask clarifying questions about my preliminary analysis as well as compare and contrast my preliminary analysis to theirs. It also served as a resource against which to review my final analysis against the preliminary themes that emerged at the time of data collection.

Triangulation of the Data

The data collected from surveys and focus group interviews were compared to one another and with primary source documents (e.g., UGA websites, databases, or reports), challenging the findings in each set. The triangulation of data helped to verify the validity and reliability of the data collected in each set and the study as a whole. It also provided opportunities to draw context or examples from the data.

The quantitative survey results aimed to answer the first two research questions, indexing what classroom design features students identify as impacting their learning, and quantifying to what extent students perceive those features impact their learning. Qualitative focus group responses were used to validate and explain the quantitative survey results in accordance with the explanatory sequential mixed methods research

design. As such, qualitative focus group data aimed to verify the accuracy of the responses obtained in the quantitative survey data, explain the survey results, and describe perceptions of how the identified classroom features impact students' learning. The primary source documents provided additional contextual information to support or challenge the findings in both the quantitative and qualitative results of the study. Many of these data sources were publicly available on the Internet, but some required specific access made available to me based on my job duties as an employee at the university or were provided by the respective university office.

Investigator Triangulation

A strategy, referred to by Merriam and Tisdell (2016) as "Investigator Triangulation," was also used to review the qualitative focus group data. This strategy requires a secondary reviewer to analyze the same data and compare results. As Maxwell (2013) described:

> The basic principle here is that you need to rigorously examine both supporting and the discrepant data to assess whether it is more plausible to retain or modify the conclusion, being aware of all the pressures to ignore data that do not fit your conclusions. Asking others for feedback on your conclusions is a valuable way to identify your biases and assumptions and to check for flaws in your logic or methods. (p. 127)

Dr. Janette Hill served as the study's primary investigator. Following my preliminary analysis, she analyzed the focus group transcripts using the provided researcher codes, and she compared her analysis to my preliminary analysis results for discrepant evidence (Maxwell, 2013; Merriam & Tisdell, 2016). We met and discussed any discrepancies and to establish alignment during analysis.

Audit Trail

Finally, I maintained a chain of evidence throughout the research process to serve as my study's audit trail (Yin, 2014). This was a central component of the organization of this study. As previously discussed, all data were collected and documented in ATLAS.ti. Archived copies of the original files were maintained separately in a password protected folder for the duration of the study. Additionally, throughout the analysis process, I maintained a series of memos describing my actions, decision-making process, and researcher positionality relevant to the data (see Appendix P for an example).

Limitations

Throughout the course of the study, there were several limitations of note. These included participant recruitment, representation in the study, group dynamics, and terminology. In this section, I describe these limitations and their potential impact on the study's results.

The study was intended to reach a broad population of students served by the DRC at UGA, but recruitment proved to be challenging. Email was the primary recruitment tool, and for many students, it has become an outdated mode of communication compared to text messaging and social media applications. My email was likely one of many they received from an unknown sender; unless the student participated in the pilot study it was likely we had no prior interactions.

Despite strong participation rates in both the survey and focus groups, not all eligible participants chose to participate. Participation in the survey and focus groups were roughly proportional to each other and the DRC's undergraduate population, but there was some variation nonetheless (see Figure 3.10). The results of the study were therefore limited to the representation and responses of a subset of the overall population;

however, the cross-section of participants gave more equal voice across all groups. This provided more representation for the needs of individuals and groups whose disabilities fell into the statistical margins of the study.
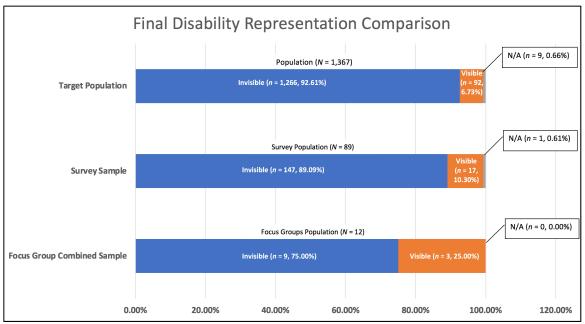
Figure 3.10. Final disability representation comparison.

The importance of representation emerged as a preliminary theme during the focus group sessions based on participant responses. While it was possible to glean insights collectively, representation in the study was limited based on the individual's unique needs or interests, their experiences, and/or their understanding of a given topic area. Additionally, the dynamics of each group were very different. For example, the first focus group had twice as many participants as the second focus group, and the conversation was driven by more outspoken participants. In contrast, the second focus group was smaller and the participants took turns responding to each question. They self-regulated their conversation to ensure each participant had a chance to respond. The balance of representation in the study's results within or between groups relied on researcher interpretations and validity checks.

Finally, there were some challenges associated with terminology that emerged during the course of the study. The terminology used in the survey and focus group interview protocols were primarily influenced by literature or UGA culture. Where applicable, efforts were made to provide some connection or translation between the term and its definition or use on campus. For example, both terms "SCALE-UP" and "active learning" were deliberately used together in the interview protocol for several reasons. First, the two terms are often used interchangeably in the literature. Second, "SCALE-UP" was a specific type of active learning classroom design that was recently incorporated in UGA's Science Learning Center, and participants might be familiar with the name if they took a class in one of the two new SCALE-UP classrooms. Finally, "active learning" was a popular topic in faculty development programming at UGA, and participants might have been exposed to this terminology if they completed a course where the faculty member used this teaching and learning method.

How participants used or understood terminology related to classroom design features could be very different than how it was intended. In the case of the SCALE-UP and active learning classroom design terminology, most participants did not have exposure to either term. Instead, they frequently distinguished between "lecture" and "group work" in their discussion about classroom design. In another example, the references to technology in the survey and focus group protocol were intended to refer to built-in classroom technology infrastructure, such as the projection system controlled at the instructor podium. Students rarely associated the term "technology" or "classroom technology" with instructors. Most often, they associated these terms with the technology used by students, such as personal laptops or assistive technologies (e.g., digital audio recorders, captioning services, etc.).

Ethical Considerations

The proposed research design and activities of this study were reviewed and approved by the UGA Institutional Review Board (IRB) prior to data collection. Although the risk for harm to participants was minimal, a number of ethical considerations were made in preparation for this study. Drawing from relevant portions of the ethical issues checklist suggested by Patton (2015), these included steps taken to explain the purpose of the study, describe research reciprocity for participants, disclose potential risks to participants, outline steps taken to maintain participant confidentiality, and obtain informed consent.

Explanation of the Study's Purpose

To ensure eligible participants understood the purpose of the study, recruitment messages, the survey instrument, and the focus group protocols were vetted by the UGA IRB and DRC gatekeepers prior to distribution or presentation. Information about the study's purpose, criteria for participation, activities and their respective dates, times, and locations were included. Additionally, contact information for the researchers and the UGA IRB were provided to participants in recruitment emails and in the survey in the event they had questions at any point during the study.

During focus groups, a brief introduction was included at the beginning of the presentation during which I introduced myself and the purpose of the study. A brief review of the criteria for participation and activities that led up to the focus group was also included. Participants were given the opportunity to ask questions before the study began and encouraged to ask questions during the focus group as needed.

Research Reciprocity

The primary benefit for participation in the study was the contribution to ongoing research in classroom design, accessibility, and the diverse needs of learners. The importance and value of participants' opinions were emphasized in the recruitment and consent materials. During the focus groups, I described how the study's results would be published publicly in the UGA Libraries dissertation database, and a summary of the results would be shared with the DRC. Participants were not compensated for their participation in the study; however, free food was provided to focus group participants.

Potential Risks

The anticipated risks to participants were minimal, primarily disclosure of personally identifiable or sensitive information. Although not public, these information types are often disclosed to authorized parties (e.g., faculty and staff) and posed a minimal risk if exposed. Information including names, demographics, disabilities, and stories of personal experiences was self-disclosed by participants as part of the study's data collection and warranted a process for protection. Identifying information was contained in password-protected files and will be destroyed within three years following the conclusion of the study. Additionally, pseudonyms were used to ensure identifying information were not disclosed as part of this study's results. This process was disclosed to participants in the consent form and discussed during the introduction of the focus groups.

Maintaining Confidentiality

As previously discussed, personally identifiable and sensitive data was collected as part of this study and efforts were made to maintain participant confidentiality. In the

consent letter and in the introduction of the focus group sessions, the following steps to maintain participant confidentiality were outlined:

- All personally identifiable information collected in this study remained confidential unless required by law

- No individually-identifiable information about participants, or provided by participants during the research, will be shared with others without written permission

- All research data would be kept on a private drive that only the researchers will have access to

- Identifying information of participants will be removed from any reports that are seen by anyone other than the researchers

- The results of the research study may be published, but your name or any identifying information will not be used

Additionally, potential confidentiality risks for participating in the online survey and in focus groups were disclosed. Survey participants were notified that every reasonable effort was taken to ensure the effective use of technology; however, confidentiality during online communication could not be guaranteed. Similarly, focus group participants were notified comments made during the session would be treated by the researchers as confidential, but that confidentiality among focus group participants could not be guaranteed. Focus group participants were asked to respect the confidentiality of others by not revealing who participated in the focus group and by not discussing what was said in the group.

Obtaining Informed Consent

At the direction of the UGA IRB, the informed consent used for this study did not require a signature from participants. By completing the survey or participating in the focus groups, participants were consenting to the study and were free to cease participation at any time. Contact information for the researchers and the UGA IRB were included in the event participants had questions prior to participation.

The consent form was distributed via email along with recruitment messages for the survey and focus groups. Participants completing the survey were presented with the consent form and were required to click the "I agree" button before proceeding. Focus group participants were provided paper copies of the consent form prior to the session, given an opportunity to ask questions prior to the session, and encouraged to ask questions as needed during the session.

Subjectivity of the Researcher

This study was influenced by my professional experiences. In addition to being a doctoral student, I am also the Executive Director of Information Technology at the Franklin College of Arts and Sciences. I started working at UGA in May 2008 providing instructional technology support, and since that time, I have been actively involved in more than 100 classroom renovation projects on campus. I have also been a participant in the planning process for new construction projects on campus — including the new Science Learning Center which opened last fall. My experience participating in classroom renovation and construction projects influenced my research interests, and I enjoy talking with colleagues and users about their perceptions on classroom design features and how they believe those features impact teaching and learning.

Over the course of my career, I have worked with a diverse cross-section of decision-makers and end-users on classroom designs for new building construction and renovation projects. It has been my experience that the primary drivers for classrooms designs are legal requirements (i.e., health and safety, ADA compliance, etc.), cost, and the personal preferences of decision-makers. It has also been my experience that these drivers do not always align with the needs of end-users, and as such, these design choices can significantly impact the teaching and learning process for the individuals who will use the classrooms. This can create a gap between the intent of the designers and the users.

I experienced this gap between the classroom's design and end-user needs firsthand early in my career as a classroom teacher and instructional technologist leading faculty training sessions. I was often assigned to a classroom that was shared or assigned for mixed use, which required permission or time away from lessons to arrange furniture to accommodate class activities. Many of the classrooms to which I was assigned did not have furniture appropriate for class activities, and often the available technology or the infrastructure to support the technology I needed was lacking. My students encountered these instructional barriers with me, and together we worked to adapt lessons around the limitations of the space.

My ability to adapt on the fly was largely influenced by my experiences working as an intern, and later the coordinator, of a summer camp. I spent several summers working with blind and visually impaired teachers and students as part of a week-long summer camp offered by the Music and Arts Center for Humanities hosted once at Agnes Scott College in Decatur, Georgia, and then moved to the Overbrook School for the Blind in Philadelphia, Pennsylvania. This camp offered high school and college students the

opportunity to study and learn to read braille music with other blind or visually impaired teachers. This experience exposed me to the many barriers students with disabilities encounter and the creativity required to adapt and rebound in the face of adversity. I spent a lot of time observing and talking with students and teachers attending the camp about their experiences in schools, and I also had the opportunity to learn about instructional design, technology integration, and classroom design from administrators at the Overbrook School for the Blind. I did not know it then, but that experience introduced me to the inclusive design strategies that have become central to my work as a teacher, instructional technologist, classroom designer, and administrator.

Today, my research interests center on one question: how can we rethink classroom design so it benefits *all* users? The first step in this process was to begin to understand how classroom design impacted the teaching and learning process. This led to my interest in working with students served by the DRC because there are legal requirements in place to ensure they received an equal education. It was my hope that this study would shed light on classroom design features that impact students' perceptions of their learning and develop recommendations for improvements that benefit all users.

My researcher role in this study places me in a position to draw from more than 15 years of experience to connect with study participants. I recognize that my professional position is one of privilege and with that comes the responsibility to serve as an advocate for ongoing improvements. I brought assumptions from my experiences with me to this study; however, it is my intention to differentiate others' experiences from my own. As previously discussed, the study incorporated a number of validity and reliability checks to ensure the data is trustworthy and to ensure I was sharing participants' perspectives in their own words. It was important to me that the results of this study

reflected how the student participants experienced classroom spaces, what features impacted their learning, and how those features impacted their academic success.

<div align="center">Researcher Role and Theoretical Orientation</div>

To focus on participants' experiences, my primary role as a researcher in this study was one of a facilitator. For the survey, participants were presented with questions I developed in collaboration with the Speaker's Bureau members; however, our interactions were limited. Participants had the opportunity to reach out to me via email with questions as needed, but we did not engage in two-way dialogue or go through the experience of completing the survey together. The survey responses directly documented the experiences of participants.

This facilitator role continued during the focus group sessions. I presented information and questions to the participants for them to discuss in an open forum, providing limited guidance to ensure the responses stayed on topic and the session ended on time. The discussion was driven by survey data, responses to the discussion questions, and interactions between participants during the discussion. However, there were times during the discussion that I engaged more actively — typically requesting clarification or offering a suggested word or phrase if a participant was lost for words. In these instances, I often drew on my prior knowledge of the university and its classroom spaces.

During data analysis, I used symbolic interactionism as the theoretical lens for reviewing and analyzing collected data. Symbolic interactionism is derived from the interpretive research traditions, which uses the context of "human interpretation as the starting point for developing knowledge of the human world" (Prasad, 2005, p. 13). The goal of research in the interpretive tradition is to understand the lived experience and the process by which meaning is made within a given context.

At its core, symbolic interactionism focuses on self in relation to other people and objects. Blumer (1969) described three premises central to symbolic interactionism as follows:

> The first premise is that human beings act toward things on the basis of the meanings that the things have for them… The second premise is that the meaning of such things is derived from, or arises out of, the social interaction that one has with one's fellows. The third premise is that these meanings are handled in, and modified through, an interpretive process used by the person in dealing with the things he encounters. (p. 2)

The emphasis on symbolism is not on the symbol itself, but rather how individuals derive and adapt meaning through social interactions in a given context. Reflexive analysis of how individuals see their role in the process of creating and adapting a symbol's meaning is also important from the standpoint of this theoretical perspective. In the context of this study, symbolic interactionism was used to support a research design and data analysis that focused on understanding the perspectives of participants, the complex meanings in their social interactions, and the processes by which meaning is developed and adapted.

Conclusion

In this chapter, the explanatory mixed methods design of this case study is described, including site selection, participant recruitment, and data collection methods. To support the validity, reliability, and trustworthiness of the data, a number of strategies were employed including member checks, peer review, data triangulation, investigator triangulation, and leaving an audit trail of my work. Additionally, a number of ethical considerations and the researcher's subjectivity were considered in conjunction with the researcher's role and the theoretical orientations of the study.

CHAPTER 4

SURVEY RESULTS

Introduction

The purpose of this study was to explore the perspectives of undergraduate students served by the UGA DRC on how the physical classroom space impacts learning for students with disabilities. In this chapter, results from survey data collection during Fall 2018 are presented. Quantitative results of the survey data and the qualitative analysis of the survey's open-ended questions are included. The results are grouped into four sections: (1) survey participant demographics, (2) impact of classroom design features (Likert scale responses), (3) classroom design features that support learning (multiple choice responses), and (4) themes from open-ended questions (open-ended question responses). A summary of the overarching themes that emerged from the survey is included at the end.

Survey Participant Demographics

The survey was distributed to all undergraduate students served by the UGA DRC ($N = 1,367$). It included Likert scale, multiple choice, and open-ended questions. Participant responses were collected over a period of 13 days. A total of 89 survey responses were included in the analysis for the study. Respondents were predominantly female ($n = 63$, 70.79%), white ($n = 69$, 77.53%), and upperclassmen ($n = 62$, 69.66%). Table 4.1 shows the participant demographics breakdown in greater detail.

Table 4.1

Survey Participant Demographics

Variable	Female (*n*)	Male (*n*)	Non-binary/third gender (*n*)	Prefer to self-describe (*n*)	Prefer not to answer (*n*)	Total (*n*)
			Gender			
Gender						
	63	25	0	0	1	89
Race/Ethnicity						
White	50	19	0	0	0	69
Asian	4	3	0	0	0	7
Black or African American	3	1	0	0	0	4
Other	3	0	0	0	0	3
Hispanic or Latino	2	0	0	0	0	2
Prefer not to answer	1	1	0	0	1	3
American Indian or Alaska Native	0	1	0	0	0	1
Native Hawaiian or Other Pacific Islander	0	0	0	0	0	0
Year in School						
Senior	28	11	0	0	0	39
Junior	20	3	0	0	0	23
First Year	9	4	0	0	0	13
Sophomore	5	5	0	0	0	10
Prefer not to answer	1	2	0	0	1	4

Self-reported majors were more distributed among the group with the highest counts reported for majors in Communication Studies (*n* = 5, 5.38%) and Human Development and Family Sciences (*n* = 5, 5.38%). These are closely followed by majors in Computer Science (*n* = 4, 4.30%), International Affairs (*n* = 4, 4.30%), Psychology (*n* = 4, 4.30%), Advertising (*n* = 3, 3.23%), Biological Science (*n* = 3, 3.23%), and

Marketing ($n = 3$, 3.23%). See Appendix Q for a complete list of self-reported majors for survey participants.

Participants represented 44 unique disabilities, almost half ($n = 18$, 40.91%) of which had only one participant response. Examples of the types of disabilities reported included chronic health (e.g., fibromyalgia, Lupus, Lyme disease, etc.), neurological (e.g., epilepsy, narcolepsy, Tourette syndrome, etc.), physical (e.g., hearing impairment, osteoarthritis, visual impairment, etc.), and psychological (e.g., ADHD, anxiety, learning disabilities, etc.). Six disabilities included in the survey received no responses and, therefore, were not represented in the study's findings. These included cerebral palsy, Chron's disease, lymphoma, multiple sclerosis, muscular dystrophy, and paraplegia. See Appendix R for a complete list of self-reported disabilities for survey participants.

The majority of survey respondents selected ADHD as a self-disclosed disability ($n = 38$, 23.03%), followed by anxiety disorder ($n = 27$, 16.36%), depression ($n = 18$, 10.91%), and learning disabilities ($n = 12$, 7.27%). More than half of the respondents selected multiple disabilities, making the total self-disclosed disabilities ($n = 165$) higher than the number of survey participants ($N = 89$). Respondents in the top-ranking categories (i.e., ADHD, anxiety disorder, depression, and learning disabilities) reported multiple disabilities the most, and those reported disabilities tended to overlap with those four categories (see a summary in Table 4.2). For example, participants with ADHD also reported having anxiety ($n = 14$), depression ($n = 8$), and/or learning disabilities ($n = 8$). Similarly, participants with anxiety disorders also reported depression ($n = 13$).

Table 4.2

Relationship Between Top Ranking Disability Categories

Variable	ADHD (*n*)	Anxiety Disorder (*n*)	Depression (*n*)	Learning Disabilities (*n*)
ADHD	38	14	8	8
Anxiety Disorder	14	27	13	4
Depression	8	13	18	1
Learning Disabilities	8	4	1	12

Impact of Classroom Design Features

When asked to indicate to what extent classroom design features impacted the respondent's learning, average participant responses across all categories indicated "some" impact or "moderate" impact on a Likert scale of 1 (least impact) to 5 (most impact), or "N/A" (not applicable). The classroom design feature category "Lines of Sight," which includes the ability to see the instructor, classmates, whiteboard content, or projected content, had the highest average for impact ($M = 3.52$, $SD = 1.02$). This was followed by the categories "Temperature" ($M = 3.00$, $SD = 1.23$), "Furniture" ($M = 2.97$, $SD = 1.37$), "Acoustics/Availability of Microphones and/or Assistive Listening Devices" ($M = 2.77$, $SD = 1.52$), "Access/Paths of Navigation/Seating Locations" ($M = 2.73$, $SD = 1.47$) and "Lighting" ($M = 2.72$, $SD = 1.44$). The response choice "N/A" was counted, but excluded from the weighted average, standard deviation, and variance calculations. Participant responses and calculations are summarized in Table 4.3.

Table 4.3

Impact of Classroom Design Features by Category

Category	Mean (*M*)	Standard Deviation (*SD*)	Variance (*VAR*)	N/A (excluded)	1 (Least Impact)	2 (Some Impact)	3 (Moderate Impact)	4 (High Impact)	5 (Most Impact)	Total
							Count (*n*)			
Lines of Sight	3.52	1.02	1.04	8	2	11	26	27	15	81
Temperature	3.00	1.23	1.50	8	8	18	29	18	8	81
Furniture	2.97	1.37	1.88	12	11	19	18	19	10	77
Acoustics	2.77	1.52	2.31	19	17	13	16	17	7	70
Access	2.73	1.47	2.17	15	14	22	14	18	6	74
Lighting	2.72	1.44	2.07	11	17	15	23	19	4	78

Classroom Design Features That Support Learning

After ranking the impact of a classroom design feature category on their learning using the Likert scale, participants were then given the option to select features that supported their learning. Two top features emerged in each classroom design feature category from the checkbox results (see Appendix S for the full breakdown of features by category). In the "Access" category, participants selected "Ability to sit in any seat in a classroom" (*n* = 36, 20.45%) as their first choice, followed by "Seating options at the front of the room" (*n* = 31, 17.61%) as their second choice. In the "Acoustics" category, the top two responses were nearly tied. The first was "Access to note-taking services" (*n* = 49, 27.07%) and the second "Instructor microphones" (*n* = 48, 26.52%).

Within the "Furniture" category, participants reported "Individual desks and chairs, mobile (e.g., small lecture classroom)" as their first choice (*n* = 39, 27.27%) and "Table seating and chairs (e.g., seminar classrooms)" (*N* = 35, 24.48%) as their second

choice. "Natural lighting from windows" ($N = 54$, 35.53%) and "Dimmable [lighting]" ($n = 40$, 26.32%) features were preferred in the "Lighting" category. For the "Lines of Sight" category, participants selected "Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor)" ($n = 51$, 27.42%) and "Instructor at the front of the room with projection on either side of the instructor podium (e.g., lecture hall)" ($n = 45$, 24.19%) as their top two features. Finally, participants selected "70-74 degrees Fahrenheit" ($n = 46$, 50.00%) and "65-69 degrees Fahrenheit" ($n = 38$, 41.30%) as their preferred ranges in the "Temperature" category. Table 4.4 presents these a summary of the top classroom design features by category.

Table 4.4

Top Classroom Design Features That Support Learning by Category

Category	Feature	Count (n)	Percentage (%)
Access	Ability to sit in any seat in a classroom	36	20.45%
Access	Seating options at the front of the room	31	17.61%
Acoustics	Access to note-taking services	49	27.07%
Acoustics	Instructor microphones	48	26.52%
Furniture	Individual desks and chairs, mobile (e.g., small lecture classroom)	39	27.27%
Furniture	Table seating and chairs (e.g., seminar classrooms)	35	24.48%
Lighting	Natural lighting	54	35.53%
Lighting	Dimmable	40	26.32%
Lines of Sight	Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor)	51	27.42%
Lines of Sight	Instructor at the front of the room with projection on either side of the instructor podium (e.g., lecture hall)	45	24.19%
Temperature	70-74 degrees Fahrenheit	46	50.00%
Temperature	65-69 degrees Fahrenheit	38	41.30%

Across all classroom design features categories that were perceived to support student learning, 13 options received the most responses (*n* > 30), representing nearly 60% of the total responses. At least two options from each of the six categories were represented in this list (i.e., Access, Acoustics, Furniture, Lighting, Lines of Sight, and Temperature); features from the category "Lines of Sight" were selected most (*n* = 3, 23.08%). "Natural lighting from windows" from the "Lighting" category received the highest number of responses (*n* = 54, 5.81%), followed closely by "Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor)" (*n* = 51, 5.48%) from the "Lines of Sight" category. The list of top selected features is presented in Table 4.5; the complete list of classroom design features participants reported as supporting their learning is available in Appendix T.

Table 4.5

Top Classroom Design Features That Support Learning Across All Categories

Category	Feature	Count (*n*)	Percentage (%)
Lighting	Natural lighting from windows	54	5.81%
Lines of Sight	Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor)	51	5.48%
Acoustics	Access for note taking services	49	5.27%
Acoustics	Instructor microphones	48	5.16%
Temperature	70-74 degrees Fahrenheit (feels like the air conditioner is cool in the summer, or the heat is turned on to warm in the winter)	46	4.95%
Lines of Sight	Instructor at the front of the room with projection on either side of the instructor podium (e.g., lecture hall)	45	4.84%
Lighting	Dimmable	40	4.30%
Furniture	Individual desks and chairs, mobile (e.g., small lecture classrooms)	39	4.19%

Table 4.5 (continued)

Lines of Sight	Using the technology in the room to facilitate class activities (e.g., presentation system, document camera, interactive tablet/touch screen for annotations, etc.)	38	4.09%
Temperature	65-69 degrees Fahrenheit (feels like the air conditioner is cold, but not blowing at full blast in the summer, or the heat is turned on to low in winter)	38	4.09%
Access	Ability to sit in any seat in a classroom	36	3.87%
Furniture	Table seating and chairs (e.g., seminar classroom)	35	3.76%
Access	Seating options at the front of the room	31	3.33%

Themes from Open-Ended Questions

The survey included two open-ended questions: (1) What other classroom design features do you perceive impacting your learning? and (2) What else would you like to share about classroom design and your learning? The first open-ended question returned 49 responses, of which 43 were included for analysis. Similarly, the second open-ended question returned 42 responses, and 33 were included for analysis. Responses indicating the participant had no feedback to provide (e.g., "N/A," "Nothing," "Not sure," or "Can't think of anything right now") were excluded from analysis. Participant responses were grouped by question and each response was analyzed using the codes developed for qualitative data analysis.

A total of 24 codes were documented 183 times during analysis of the open-ended question responses. Of those codes, 10 received more than 80% of the total frequency counts (see Table 4.6). Codes were organized into code groups representing four overarching themes that emerged from the data: (1) Classroom Design Features, (2) Instructional Use, (3) Impact, and (4) Institutional Infrastructure.

Table 4.6

Open-Ended Questions Analysis: Codes with the Highest Frequency Counts

Code	Count (*n*)
Feature: Furniture	31
Feature: Personal Space/Overcrowding	22
Feature: Technology	16
Feature: Accessible Seating Location	15
Impact: Other	14
Use: Lecture	14
Feature: Aisles	10
Infrastructure: Education/Training Gap	9
Feature: Acoustics	8
Feature: Lighting	8

Classroom Design Features is the largest code group, containing 18 codes representing specific features (e.g., furniture, personal space/overcrowding, technology, etc.). The other groups are smaller, with Instructional Use containing two codes (i.e., lecture, group work), Impact containing seven codes (e.g., Unwanted Attention, Independence, Benefits All Users, etc.), and Institutional Infrastructure containing four codes (e.g., Education/Training Gap, Bureaucracy, etc.) The code groups, codes contained therein, and the total frequency counts are summarized in Table 4.7.

Table 4.7

Open-Ended Survey Questions: Code Groups Organized by Frequency Counts

Code Group	Count (n)
Classroom Design Features	136
Furniture	31
Personal Space/Overcrowding	22
Technology	16
Accessible Seating Location	15
Aisles	10

Table 4.7 (continued)	
Acoustics	8
Lighting	8
Line of Sight	5
Renovation Needs	5
Door/Exit	4
Inaccessible Classrooms	3
Paint Color	3
Temperature	2
White Board	2
Elevator	1
Handicap Parking	1
New Construction	0
Ramp	0
Instructional Use	18
Lecture	14
Group Work	4
Impact	17
Other	14
Unwanted Attention	2
Independence	1
Benefits All Users	0
Devaluation of DRC Students	0
Relative to Individual	0
Institutional Infrastructure	12
Education/Training Gap	9
Favorite Classrooms	2
Least Favorite Classrooms	1
Bureaucracy	0

It is within the context of each of the four overarching themes that the results of the open-ended survey questions are presented in the subsequent sections. Due to the large frequency counts in the Classroom Design Features theme, the results are limited to the top 10 codes which make up approximately 90% of the total responses for that theme.

Additionally, the frequency counts (*n*) in these sections represent the number of participants who responded, not the frequency count of the code.

Classroom Design Features

Participants reported Classroom Design Features (*n* = 136) most often in the open-ended questions. This category is further organized into 18 codes representing specific classroom design features, and of those, seven received more than 80% of the responses. These include (1) Furniture, (2) Personal Space/Overcrowding, (3) Technology, (4) Accessible Seating Location, (5) Aisles, (6) Acoustics, and (7) Lighting.

Furniture. The predominant classroom design feature that emerged during analysis of the open-ended questions was furniture (*n* = 31). Participants exclusively described student furniture and often used student furniture terminology interchangeably. For example, there was little or no distinction between student seating represented by chairs, desks, or tables. In places where participants specified a piece of furniture (e.g., desks, tables, or chairs) a secondary code for that furniture type was added. Desks (*n* = 17) and chairs (*n* = 13) were identified most frequently, but there were a few references to stadium-style seating in lecture halls (*n* = 5) and tables (*n* = 1) specifically.

Feedback about furniture centered on the comfort (*n* = 14) and size (*n* = 13) of student furniture. In one example, a participant described the comfort of classroom chairs saying, "…those hard-plastic shaped ones or wooden ones are so uncomfortable and hurt+sometimes [*sic*]." Other participants described the lack of desk or table space available to complete work. In one such example, a participant responded to the first open-ended question saying, "Having space for a test booklet, answer sheet, textbook or laptop, calculator, and tiny bit of space between students" impacted their learning. Similarly, another student responded to the second open-ended question by describing

their preference and classroom experience as follows, "Bigger desk space. We are expected to have our notes, pens, and our books on a desk that is not even a 12' by 12' [*sic*] desk space."

Personal Space/Overcrowding. In addition to the comfort and size of the furniture, issues related to personal space and overcrowding (*n* = 22) ranked second overall in the frequency of participant responses in the analysis of the open-ended questions. Feedback from participants reflected a strong preference for increased personal space. In one example, a participant summarized her preference for personal space more generally saying, "The more room I have to spread out the better I can learn." Another described her preference for personal space saying:

Very close seating options makes [*sic*] me a little anxious, as do very long rows of seats without isles [*sic*]. I like to have room to spread out notes and a laptop or book, so the small individual desks are very inconvenient and almost claustrophobic.

Participants also discussed their preference for personal space in response to overcrowding in classrooms. In one example, a participant described overcrowding at exits during class changes saying:

My lecture halls are sometimes around 500 students and there are two exits. As one class is trying to come out the next is trying to come in at the same time. Maybe have designated "enter" and "exit" doors like at the grocery store to facilitate traffic.

Another participant described overcrowded classrooms due to inadequate seating saying, "The amount of student to desk ratio. (Some classes have more students than seats) [*sic*]."

Technology. A third classroom design feature to emerge during analysis of the open-ended survey questions was technology (*n* = 15). Feedback from participants centered on issues of access and use of technology in class by both students and instructors. Participants frequently referenced their use of laptops in class and challenges that impacted use, but examples of other technologies (such as classroom and assistive technologies) were described.

Classroom infrastructure was the primary area that participants indicated impacted access and use of student technologies. As previously discussed, responses to the open-ended questions indicated many student furniture options were too small to support the varied technologies and materials current students commonly need as part of class activities. Another challenge shared by the participants was access to working outlets at student seats. As one participant described, "I need outlets to charge my devices and classrooms in places like the MLC [Miller Learning Center] don't have any or they have about four in the back of the room where there are no seats." A third example indicated some classroom designs currently do not adequately facilitate the instructional technologies used therein. As one participant described:

> The ability to see the board or projector is sooo [*sic*] important! I sit in the 3rd to back row of a seminar style classroom in Caldwell Hall, and I cannot see anything the professor puts on the board, and I also struggle to see the numbers on the projector. I have good vision, so not being able to see the board makes it really difficult to learn the material.

Open-ended responses from participants also discussed classroom practices as they related to technology. In one example, a participant reported instructor-specific policies that prohibited technology use. As she described, "Some professors have strict no

tech rules in their classroom and this hurts my ability to keep up in class when the professor moves through the slides too fast." In another example, a participant simply stated, "Ability to use personal learning device," indicating there were some classroom settings where this may not be possible or prohibited. In contrast, another participant described the impact of distractions caused by student technology use saying, "How other student's sit like if they fidget in their chair and how they take notes. I find typing on a computer incredibly distracting, especially if I can see the screen."

Accessible Seating Location. Seating location preferences were noted by multiple participants ($n = 15$). Location preferences tended to be unique to each individual and their respective needs, but participants tended to describe their seating preference in relation to either the instructor or fellow students. For example, one participant described her seating location relevant to their professor as follows:

> Obviously lecture halls are stressful, but I usually sit in the front so I can hear easier and pay better attention. However, I don't like being in the front of small classrooms, so I think that the tables and/or seminar classrooms would be helpful to keep me both paying attending [*sic*] and also not having to be directly in front of the professor since both are equally stressful to me.

In contrast, a participant described her preference to avoid distractions saying that one way is by creating, "Distance from other students around me. Should be an option to not be right next to other students because they tend to talk/disrupt and I miss crucial information." Similarly, another participant described her preferred seating location saying, "The most important feature to me is having the ability to sit in the front row to avoid distractions from other students." One participant described his ideal placement both in relation to the instructor and fellow students saying, "being able to see the

teacher, not being too cramped with people, having my own space, but at the same time still connected with rest of class."

Aisles. Narrow aisle space (*n* = 10) was a specific pain point for participants. As one participant described, "Finding seats is stressful to me, I'd like them to be more spaced out in between rows in front and the seats behind each row. I need more leg space to feel comfortable." This was echoed by another participant who explained, "Isle [*sic*] seating is preferred for easy access and ability to leave if feeling overwhelmed or need to use the bathroom and don't have to squeeze through everyone else in the row (if sitting in middle) [*sic*]."

Acoustics. Participants also discussed classroom acoustics (*n* = 8). The feedback focused primarily on distracting noises, such as dripping faucets or loud overhead lights, in classrooms and the ability to hear the instructor. As one participant explained, "Classrooms and labs sometimes have too high background noise, students on hearing aids or with sensory processing problems cannot cope with." The participant continued, suggesting that, "All classrooms and labs should have designs to reduce noise when 100 equipment [*sic*] is vibrating or 100 students are talking." This was echoed by another participant, who described challenges in large classrooms saying:

> Often extremely hard to hear professors in large classrooms, especially lecture halls when noise of students around me is taken into consideration. Ability to focus and take in information all the way around is greatly affected by these factors.

Feedback suggested that class size and ambient noises associated with them impacted their choice in seating location and ability to learn.

Participants shared examples where they had trouble hearing the instructor in classrooms and suggested alternative actions to support student learning. In one such example, a participant explained, "Whiteboards in classroom makes professors turn away from audience [*sic*] which makes it harder to hear." She continued, "If professors had a laptop in which they could use as a whiteboard which could be projected, that would be helpful. This way, they are still facing the students while writing on the 'board' which is their laptop." Another participant suggested, "Professors should be required to wear microphones. No matter what."

Lighting. The final classroom design feature that reached top rankings from survey participants was lighting ($n = 8$). Feedback indicated participants preferred natural lighting in classrooms. Described by one participant, "Large open windows that let in natural light really help me wake up and focus." Another commented, "I also love natural light and being able to see nature, it calms me."

For one participant, however, too much light was a problem. She explained, "If there is backlight in the room it hurts my eyes to look at the teacher for a long time." This example contrasted the experiences shared by most often participants, who described poorly lit classrooms. As one participant stated, "Most of the classrooms are very dim, cold, and little room to feel comfortable to learn." This was echoed by another who said, "Dark, windowless rooms and lecture halls are often slightly more stressful." To improve these classrooms, a third participant suggested, "If you cant [*sic*] have windows, at least make the walls colorful so I don't feel sad and in prison."

Instructional Use

Participants frequently mentioned instructional practices ($n = 18$). For example, when describing teaching and learning practices, one participant explained:

It would help me to always be able to access slides DURING [participant's emphasis] the lecture so that I can keep going at my own pace and not fall so far behind when the professor moves on while I'm in the middle of taking notes.

Participants differentiated between lecture ($n = 14$) and "group work" ($n = 4$) teaching and learning practices, but group work was referenced less frequently.

Another participant described a lecture hall classroom design saying, "Often extremely hard to hear professors in large classrooms, especially lecture halls when noise of students around me is taken into consideration." Participants tended to differentiate lecture halls from other classroom designs, but the terminology for non-lecture classroom designs was not consistent and not easily tracked. For example, one participant described a SCALE-UP classroom in the Science Learning Center as a "Group Learning" room. Classroom designs were typically described based on capacity (e.g., "class sizes of 15 to 50 students") or activities (i.e., lecture, group work, or lab).

Impact

A third theme represented in the open-ended data related to how classroom designs or institutional practices directly impacted participants ($n = 17$). A few shared examples about how participants' level of independence was impacted ($n = 1$) and/or they received unwanted attention ($n = 2$). For example, one participant described, "…my accessible furniture is nearly always moved somewhere around the room. I have to ask classmates or my professors to help me move my desk where it should be, and I am dependent on their willingness to help."

Most examples of the impact on participants' learning experiences were unique and not easily grouped ($n = 14$). For example, one participant responded simply, "Big lecture halls are difficult." While it was clear lecture halls had a negative impact on the

individual, the lack of context made it impossible to interpret in what ways the classroom poses challenges. Other examples shared unique needs of individuals, such as one participant's feedback that "Contrast of power points [*sic*] and dry erase markers" impacted their learning or the self-identified combat veteran who stated, "My back needs to be to a wall, and I don't want anyone walking behind me." Individually, these quotations ranked low in frequency; however, when grouped under an "Impact: Other" code the frequency count ranked in the top 10 participant responses overall.

Institutional Infrastructure

The final theme that emerged from participants in the open-ended survey questions were issues related to institutional infrastructure ($n = 12$). While a few participants noted their favorite ($n = 2$) or least favorite ($n = 1$) classrooms on campus, most participants identified education or training gaps ($n = 9$). Most examples of education or training gaps focused on PowerPoint slides and whiteboards used in class to present course content and instructor notes, while others identified needs related to instructional support services.

With respect to PowerPoints and whiteboards, two participants focused on high contrast font or marker colors. In one example, the participant noted, "I think professors should be conscious of what they use to write on the board or what font colors they use on presentations." Other participants discussed challenges related to slides and note taking. As one participant explained, "Some professors wait until after the lecture is over to upload the slides covered in class to ELC [the learning management system], and some professors decide not to upload their slides at all." The participant continued:

It would help me to always be able to access slides DURING the lecture so that I can keep going at my own pace and not fall so far behind when the professor moves on while I'm in the middle of taking notes.

Similarly, another participant explained, "Some professors have strict no tech rules in their classroom and this hurts my ability to keep up in class when the professor moves through the slides too fast." A third participant suggested having the ability to see the instructor's notes presented on their personal device while the instructor was writing.

Instructional support services were another area identified by participants. Examples that participants noted centered on access to support services and training needs. With respect to access, one participant simply stated, "Access hours to tutors" as impacting their learning in response to the first question. Another suggested incorporating technology "with a 'buzzer' like feature or have TAs in the classroom to assist with answering questions." A third suggested, "Being given more time on tests…"

One participant suggested that there were training needs for both American Sign Language (ASL) interpreters and note takers. The individual stated:

The ASL interpreters and the notetakers are not always adequately trained in the specific subject. ASL interpreters' science knowledge is not enough for most deaf students. ASL interpreters at UGA do not cooperate in a lab setting. Besides, notetakers have no knowledge which type of note organization would suit ADD/ADHD/ASD. Often low-quality notes.

This comment was isolated; no other training gaps were identified in the open-ended survey responses.

Conclusion

The results of the survey reflected a number of interesting data points. The demographics of the survey's participants largely paralleled those of the overall undergraduate student population served by the UGA DRC. Feedback indicated the average impact in most classroom design feature categories was "some" to "moderate" across the overall population. There were, however, features that participants indicated supported their learning.

In each of the six classroom design feature categories (e.g., access, acoustics, furniture, etc.), two features emerged with the highest frequency counts (see Table 4.5 on page 85). These features were also included in the list of the highest ranked features across all categories, representing nearly 60% of all responses. The top features participants identified were the following:

1. Lighting: Natural lighting from windows

2. Lines of Sight: Ability to view content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor)

3. Acoustics: Access for note taking services

4. Acoustics: Instructor microphones

5. Temperature: 70-74 degrees Fahrenheit (feels like the air conditioner is cool in the summer, or the heat is turned on to warm in the winter)

6. Lines of Sight: Instructor at the front of the room with projection on either side of the instructor podium (e.g., lecture hall)

7. Lighting: Dimmable

8. Furniture: Individual desks and chairs, mobile (e.g., small lecture classrooms)

9. Lines of Sight: Using the technology in the room to facilitate class activities (e.g., presentation system, document camera, interactive tablet/touch screen for annotations, etc.)

10. Temperature: 65-69 degrees Fahrenheit (feels like the air conditioner is cold, but not blowing full blast in the summer, or the heat is turned on to low in winter)

11. Access: Ability to sit in any seat in a classroom

12. Furniture: Table seating and chairs (e.g., seminar classroom)

13. Access: Seating options at the front of the room

Feedback from open-ended questions reflected four overarching themes that included Classroom Design Features, Instructional Use, Impact, and Institutional Infrastructure. Classroom Design Features was the predominant theme that focused primarily on seven features. These included furniture, personal space and overcrowding, technology, accessible seating location, aisle space, acoustics, and lighting. Participant feedback suggested that classrooms designed with comfort and access in mind are preferred. Examples included comfortable student seating, access to preferred seating locations, adequate personal and aisle space, facilitate student and instructor technologies, good acoustics, and incorporates natural lighting.

CHAPTER 5

FOCUS GROUP RESULTS

Introduction

In this chapter, the results of the qualitative analysis of focus group transcript data collected during Fall 2018 are presented. All undergraduate students registered with the UGA DRC ($N = 1,367$) were invited to participate in one of two, hour-long focus group sessions, and a subset of the overall population attended ($N = 12$). The results of the analysis are organized in two primary sections: (1) focus group participant demographics and (2) themes from the focus group questions. The second section on focus group themes is broken down further into five sub-sections, presenting the themes that emerged in response to each discussion prompt. These include: (1) classroom design features with the most impact, (2) top results for ideal classroom design features, (3) classroom types that facilitate learning, (4) suggestions for designing classrooms, and (5) favorite and least favorite classrooms. A summary of the overall focus group study's findings is included at the end.

Focus Group Participant Demographics

A total of 12 participants ($N = 12$) attended the focus groups, with eight ($n = 8$) participating in the first focus group and four ($n = 4$) participating in the second group. Both sessions lasted approximately one hour in duration. The focus groups followed a semi-structured interview protocol during which participants were asked to review and discuss the results of the survey data and describe their experiences.

In the first focus group, a few participants ($n = 3$) left before the session concluded, so the population size (N) is noted in conjunction with each question to indicate how many people were present for each question across both focus groups. All participants across both sessions spoke at least once; nearly all participants ($n = 11$) provided multiple responses. Participation data, represented by pseudonyms and generalized disability categories to protect identity, are summarized in Table 5.1.

Table 5.1

Focus Group Quote Counts

Participant	Gender	Disabilities[a]	Focus Group	Quotes in Transcript (n)
Ava	Female	Cardio-Vascular Injury, Hearing Impairment, Mobility Impairment, Traumatic Brain Injury	1	71
Olivia	Female	Mobility Impairment, Chronic Illness	1	63
Bailey	Female	Narcolepsy	2	63
Jennifer	Female	ADHD, Anxiety Disorder	2	33
Sarah	Female	Anxiety Disorder, Auditory Processing Disorder, Obsessive Compulsive Disorder	2	31
Jane	Female	Epilepsy	2	28
Mason	Male	Hearing Impairment	1	28
Zoey	Female	Lupus	1	26
Mia	Female	Anxiety Disorder, Auditory Processing Disorder	1	13
Anika	Female	Anxiety Disorder, Mobility Impairment	1	12
Emma	Female	Traumatic Brain Injury	1	9
Multiple Participants[b]			1 & 2	8 & 12
Grace	Female	Muscular Dystrophy	1	1

[a]Categories created with list from DRC. [b]Indicates two or more participants said the same word or phrase simultaneously and distinguishing who spoke was not feasible.

Although participants were not required to disclose demographics data as part of the focus group session, all were given the option to complete the demographics portion of the survey. Most participants ($n = 9$) completed the demographics survey, but some information was gleaned from self-disclosed information discussed during the focus group sessions. The groups were observed to be predominantly female ($N = 11$, 91.67%) and, based on the available information, represented a cross-section of disabilities including mobility or muscular skeletal impairments, deaf or hard of hearing, neurological, chronic health, and psychological disabilities.

Themes from Focus Group Questions

A total of 31 codes were documented 370 times during analysis of the focus group transcripts. Codes were organized into a series of code groups, which denoted overarching themes related to the codes contained therein. Across all codes, 10 received more than 64% of the total frequency counts (see Table 5.2).

Table 5.2

Focus Group Data: Codes with the Highest Frequency Counts

Code	Count (n)		
	Focus Group 1	Focus Group 2	Total
Feature: Furniture	28	19	47
Use: Lecture	12	19	31
Feature: Technology	13	15	28
Feature: Line of Sight	11	13	24
Feature: Acoustics	9	12	21
Feature: Personal Space/Overcrowding	4	16	20
Use: Group Work	9	10	19
Impact: Unwanted Attention	11	6	17
Feature: Accessible Seating Location	6	10	16
Feature: Aisles	6	8	14

The results of the focus group data reflected four overarching themes derived from the 31 codes identified during analysis. These included Classroom Design Features, Impact, Instructional Use, and Institutional Infrastructure. These four thematic code groups along with the total frequency counts of the codes contained in each group are presented in Table 5.3.

Table 5.3

Focus Group Data: Code Groups Organized by Frequency Counts

Code Group	Count (n)
Classroom Design Features	234
Furniture	47
Technology	28
Lines of Sight	24
Acoustics	21
Personal Space/Overcrowding	20
Accessible Seating Location	16
Aisles	14
Inaccessible Classrooms	13
Lighting	13
Temperature	11
Ramp	6
Door/Exit	5
Renovation Needs	5
Elevator	4
White Board	4
New Construction	2
Paint Color	1
Handicap Parking	0
Impact	53
Unwanted Attention	17
Benefits All Users	11
Independence	11
Relative to Individual	5

Table 5.3 (continued)	
Other	4
Adapt	3
Devaluation of DRC Students	2
Instructional Use	50
Lecture	31
Group Work	19
Institutional Infrastructure	33
Education/Training Gap	13
Favorite Classrooms	9
Least Favorite Classrooms	9
Bureaucracy	2

It is within the context of each of the four overarching themes that the results of the focus group questions are presented in the subsequent sections. Due to the large frequency counts in the Classroom Design Features theme, the results are limited to the top 10 codes which make up approximately 90% of the total responses for that theme. Additionally, the frequency counts (n) in these sections represent the number of participants who responded, not the frequency count of the code.

Classroom Design Features with the Most Impact

The focus group followed a semi-structured interview protocol which included eight primary questions with optional follow-up questions:

1. Slide 1: How relevant are these features to your learning?

2. Slide 2: How do these features impact your learning? What are the most important classroom design features for your learning? Why? Can you tell me a story or provide an example of how your learning was impacted?

3. Slide 3: What types of classrooms do you find facilitate your learning?

4. Slide 4: For a lecture hall, what are the ideal design features for your learning?

5. Slide 5: For a classroom with tables and chairs, what are the ideal design features for your learning?

6. Slide 6: For a classroom with desks, what are the ideal design features for your learning?

7. Slide 7: Does this type of classroom (SCALE-UP/Active Learning) facilitate your learning? For SCALE-UP or active learning classrooms, what are the ideal design features for your learning?

8. Slide 8: What are your favorite and least favorite classrooms on campus? What else would you like to tell me about how classroom design impacts your learning?

Participant responses to each question were grouped into units based on the topic the participant discussed (denoted by the code "Impact: Stories"), and each response unit was analyzed using the codes developed for qualitative data analysis.

Following the introduction and overview slides, focus group participants were presented with the first informational slide and question for discussion. This slide, titled "Classroom Design Features with the Most Impact" (see Figure 5.1), summarized the preliminary analysis of the survey's Likert scale results ranking the impact of the listed classroom design feature categories, ranking the average impact response values from most to least.

Figure 5.1. Likert scale results ranking impact of classroom design features.

The order and mean response values presented in this slide differed from the final survey results listed in this study (see Table 4.3 on page 83). This is because results marked "N/A" (not applicable) were originally included in the preliminary analysis calculations. During the final analysis, it was determined the "N/A" results should be acknowledged, but discarded from the count, mean, standard deviation, and variance calculations because "N/A" was defined as "not applicable" (as opposed to "no impact"). As will be discussed in this section, the category order and impact values as presented in this slide had little or no impact on the focus group results.

Impact Relevant to Individual Needs. While viewing this initial slide, participants were asked the question, "How relevant are these features to your learning?" following the interview protocol. Across both focus groups ($N = 12$), a subset of participants ($n = 10$) responded to the question. Each person who responded disagreed with the order of the categories and the level of impact, instead suggesting one or two categories based on their individual needs. For example, Olivia who was a wheelchair user expressed her surprise in the first focus group that furniture was not more highly ranked saying:

…I would have expected access and furniture to be higher. I know that,

personally, those are some of the biggest issues I face on campus in rooms… But,

yeah, I definitely think that UGA still has a long way to go in terms of making

sure that all of their classrooms and furniture is accessible — or at least providing

the option.

In another example, a participant in the second focus group name Sarah explained:

For me, since my issues are mostly auditory, I would say acoustics is the most

important thing for me. It's nice when the classroom isn't extremely echo-y or if

there's a little bit of white noise in the background to distract from other… or to

limit distractions of other noises.

Participant responses indicated furniture ($n = 4$) had the highest impact. This was

followed by access ($n = 3$), acoustics ($n = 3$), line of sight ($n = 3$), lighting ($n = 2$), and

temperature ($n = 1$). Participant responses and examples of their rationale for identifying

a given category are summarized in Table 5.4.

Table 5.4

Summary of Focus Group Participants' Perceptions on Impact by Category

Participants	Feature	Examples of Rationale
• Anika • Ava • Olivia • Zoey	Furniture	• Uncomfortable • Work surface too small to hold student items (e.g., books, notes, laptops, etc.) • Size too small to seat students (including those not served by DRC) • DRC-issued desks created unwanted attention/impedes independence • Attached to floor/immovable • Designed for right handed or left handed users
• Bailey • Jennifer • Sarah	Access	• Preferred seating location • Access to accessible seating location

Table 5.4 (continued)

•	Emma	Acoustics	•	Instructor use of microphones
•	Mason		•	Impact on digital audio recorders/note-taking
•	Sarah		•	Echoes
			•	White noise to limit distractions
•	Jane	Line of Sight	•	Ability to see instructor
•	Jennifer		•	Ability for instructor to see students
•	Mason		•	Ability to maintain focus on instruction
•	Jane	Lighting	•	Impacts lip reading
•	Mason		•	Bright or fluorescent lighting can be problematic
•	Bailey	Temperature	•	Affects ability to focus/stay awake

Participants were asked to think about the DRC undergraduate population as a whole and consider whether or not the classroom design features they identified would have a high impact on everyone. Consensus across both focus groups was that impact was relative to the needs of the individual. The resulting discussion about the impact of the classroom design features identified in Table 5.4 centered on the individual needs of the participants present for the focus groups.

Furniture. A focal point for discussion, particularly in the first focus group, was furniture (*n* = 4) as a number of participants complained about inadequate student furniture in classrooms. Participants noted much of the furniture was too small or uncomfortable, and they often opted for accessible desks, chairs, and testing accommodations via the DRC as a result. As Anika described:

Their desks are tiny. My laptop is this big, and I can still barely fit it on the desk. So, when it comes time to take [an exam]… and now I'm taking Anthropology and when I took History, they want you to write long essays. So, for me to write that on a tiny desk — I have no place to put my arm. I have no place to read. So,

the accommodation works great to be able to take it [the exam] at the DRC, but it

still would be nice to be able to take it in class or have that option.

Participants explained this problem was not unique to students receiving services from

the DRC. Ava, a participant in the first focus group, described, "I've had other people tell

me, you know, because of their size they can't fit in furniture. And they... they just can't

fit in the desks." Later, Ava added:

And just as a whole other side note, there's [*sic*] buildings that have desks that

there's no left-handed desk, and you're required to write essays like you said. And

there's [*sic*] some people who don't have a disability, so they don't have the option

to go in the DRC into alternative testing. How do they test if the desks are

screwed into the ground and they're left-handed? Or, how do they just write their

notes?

For students receiving support from the DRC, opting for a DRC-issued desk often

resulted in unwanted attention according to several participants. Olivia explained in the

first focus group, "But I think having to request them from the DRC — not just having

them as a permanent option — you stand out." She continued, "You have to make a

request, and a lot of people don't want to be a bother. They don't want that attention."

Another participant in the first focus group, Emma, added, "They don't want to be *that*

person." Ava noted that the DRC-issued desks come with stickers which identify their

purpose:

Not only does it have a beautiful sticker that displays that you've got a disability

and that this is saved, or reserved, for you — which is great so that people don't

take it — but it's just, you know, it's also my personal business out there that I

don't need.

She continued:

> People ask me, "Why do you need that?" or, you know, I don't… it's… I don't…
> I'm not comfortable having to explain to everybody all the time. Some days I'm
> fine with saying what's going on, but, you know, how am I going to tell somebody
> my entire life story in 30 seconds before class starts?

For Jennifer, a participant in the second focus group, the prominence of the
stickers was a contributing factor for why she did not opt for DRC-issued desks in her
classes. She explained:

> I know that I have the accommodation [to sit in the front row], but I'm not the
> kind of person who would start the conversation and be like, "Hey, can you
> move?" or, I don't know if I feel comfortable having a name tag [on the desk].

She continued, "I don't like when it's just reserved for this time period. I've seen that on
the desk, and when you sit there I feel like people are like, 'Oh, why is she sitting there?'
and… [groans]." Jennifer's strategy for avoiding unwanted attention was to arrive to
class 30 minutes early whenever possible to select a seat in the front row.

Other participants described problems with DRC-issued furniture being moved,
claimed, and vandalized by other students. As Olivia described, "…because they're
temporary added options, almost every single class period, my accessible furniture is
moved all over the classroom, and I have to rely on someone else pulling my desk across
the room to where it's supposed to be." Ava added, "Or other people are like, 'Oh, I'm
gonna get this desk 'cause she's late today!'" She continued, "I always have to get into
my class early to move my desk…"

Zoey, a participant in the first focus group, experienced all of these issues but added her DRC-issued desk had been repeatedly vandalized by students in one classroom. Expressing her frustration, she described:

> I come back to my desk. It's at the very top of the lecture hall. There's drawing on the desk! *Drawing!* With *pen* and *pencil!* I was like, "This desk does not belong to you. To you all. Why would draw on it? Why would you do this?! It's not yours! It says it belongs to the DRC. It says don't move it!"

She continued:

> It's very frustrating. Every time I miss that class, I'm like, "Oh, God. What are they going to do with that desk?" It's very expensive. I'm responsible for it, kind of, right now because it's checked out under my name. And I don't know why they just can't not use it because they keep drawing on it and leaving trash in it.

> **Access**. Another category discussed by multiple participants was access ($n = 3$). While issues of access were discussed primarily in the context of DRC-issued furniture in the first focus group, the second focus group talked about access as it related to preferred or accessible seating locations in conjunction with other categories such as line of sight or acoustics. For example, Jane explained her preference for sitting in the front row, saying:

> I don't have the accommodation for priority seating, but it definitely helps me stay focused. And it kind of almost puts me at ease to have the professor, kind of, have a watchful eye because if I have told them about the epilepsy they're more likely to be aware of it and to, kind of, yeah... just keep a watchful eye just in case.

Similarly, Sarah discussed her preference for sitting in the rear of most classrooms saying:

It actually helps me to sit at the very back of classrooms because noises are particularly distracting to me if they're coming from all sides. So, if I can localize them all to in front of me, then it's easier for me to pay attention. So, I try to always get the seat the farthest back or to the side or something.

During the second focus group, both Bailey and Jennifer discussed access in the context of prioritized seating accommodations in the front of the classrooms. As previously discussed, arriving to class at least 30 minutes early was Jennifer's solution to ensuring she could obtain access to her accessible seating location. Bailey commented, "I *do* [participant's emphasis] agree with her point of the getting to class early and sitting in the front 'cause if I'm able to do that, that's great. But so many times other people are sitting in the front…" To avoid a confrontation with other students, Bailey suggested talking with the instructor privately after class about ensuring a seat remains available or to assign seats. In contrast, Jennifer preferred to avoid any unwanted attention altogether saying, "I'll honestly sit a couple of rows back and just take the loss and just look at my note-taker's notes at the end of the class period."

Acoustics. Several points of discussion emerged with respect to the impact of acoustics ($n = 3$). For Emma, she was surprised acoustics did not measure as having a higher impact on survey participants based on her experience with note-taking services. She explained, "…if the professor is walking around, and they don't have the mic on, then my recorder won't, won't pick them up." She continued:

> And if I miss those notes, then I have to depend on my note-taker that they got it — and sometimes they don't get it — and it's, like, "I hope that's not on the test because I didn't get it, my note-taker didn't get it, the professor is walking around without a mic."

For Mason in the first focus group and, as previously discussed, Sarah in the second, echoes and the amount of noise in the classroom were points of concern. As Mason explained:

> I've been in a classroom where, you know, they do set up a microphone system. And I remember that one room in the Chemistry building where, I guess, there's a lot of echoing going on in the background, and I feel like that has a lot to do with how the room is designed. So, room design, I think, is also really important.

Line of Sight and Lighting. Line of sight ($n = 3$) was important for participants to be able to see the instructor, have the instructor see them, or maintain focus on class activities. As previously discussed, Jennifer's ADHD required her to sit in the front of her classrooms to maintain focus in class, and Jane felt more comfortable being visible to her instructors in the event she had a seizure. For Mason, however, seeing the instructor was critical for reading lips. As he described, lighting also played an important role in conjunction with line of sight:

> So, I depend solely on lip reading. So, lines of sight is important. Lighting is also important. I don't like it when the professor, you know, turns the lights off just to see a PowerPoint. And now, I mean... I hear something, but doesn't necessarily guarantee that I am listening.

Lighting ($n = 2$) was also discussed in conjunction with Jane's epilepsy, "With my epilepsy, I'm very sensitive to light especially very, very bright, and so I think that would be the one thing that – not triggers it necessarily – but it does bother me in a sense."

Temperature. Finally, Bailey discussed the impact of temperature ($n = 1$) on her learning. She explained, "Well, for me, due to my narcolepsy, I'd rather have a cold classroom than a hot classroom, but not everyone is like that. For me, that just helps me

stay awake." While not discussed in conjunction with this first slide, participants explored the impact of temperature in greater depth later in the discussion.

Response Summary. In the first focus group, participants viewed the classroom design categories as interrelated. As Zoey began, "See… furniture kind of goes under access, I guess?" Several participants agreed when asked in follow-up to Zoey's suggestion if the categories access, furniture, and lines of sight should be grouped together. As Emma described, "Because I think if you don't have the right furniture then you can't get access. Or if you don't have the right access, then you can't get the appropriate furniture that you need." Emma continued, "I would also think that acoustics and lighting could probably go together because one's hearing and the other has to do with sight, so I would think those two could go together." Olivia agreed and suggested, "And they also both have to do with the construction of the room." Temperature was the only category not specifically grouped by participants in the first focus group.

Across both focus groups, participants found the relevance and impact of the listed categories differed between them, and in some cases, contradicted their own needs. For example, Jennifer responded to Sarah's suggestion in the second focus group about her need for white noise and explained that it could have a direct negative impact saying:

> …because like she was talking about, white noise kind of thing. I don't know, I have ADHD and sometimes I can handle it, but it really depends if I've taken my Adderall [ADHD medication] that day. What kind of white noise – like if some really close to me is talking the whole class period. A lot of things affect that.

When asked, the consensus in both focus groups was that the impact was dependent on the needs of the individual. The response from the second group was a unanimous, "Yes." In the first focus group, Olivia summarized the group's perceptions saying:

…is it more of a mobility thing? Is it a learning disability? Because I know people

who have issues with acoustics and lines of sight… I don't know that there are

ones that stand out above the others. I think it's just relative to the student.

Although focus group participants did not agree with the order or levels of impact as

listed in the survey results, feedback indicated the results were likely the outcome of

individual perspectives and needs. For the participants attending the focus groups, the

classroom design features that had the most impact were furniture, access, acoustics, line

of sight, lighting, and temperature.

Top Results for Ideal Classroom Design Features

The second slide presented the classroom design features that received the most

survey responses indicating they supported participants' learning; it was titled "Ideal

Classroom Design Features" (see Figure 5.2 below). Focus group participants ($N = 12$)

were asked to reflect on how the listed features impacted their learning, sharing stories or

examples of impact that were either positive or negative. As with the first question, a

subset ($n = 10$) responded to the question.

Ideal Classroom Design Features

Category	Feature	Count
Lighting	Natural lighting	54
Line of Sight	View content from seat	51
Acoustics	Access for note taking	49
Acoustics	Instructor microphones	48
Temperature	70-74 degrees	46
Line of Sight	Instructor at front of room	45
Lighting	Dimmable lights	40
Furniture	Desks and chairs (separate)	39
Line of Sight	Using technology	38
Temperature	65-69 degrees	38
Access	Sit in any seat	36
Furniture	Tables and chairs	35
Access	Seats at front of room	31

Figure 5.2. Top checkbox results of classroom design features that support learning.

Participants typically identified one or more ($n < 5$) classroom design categories

or specific features relevant to their individual needs. Table 5.5 below summarizes the

categories and features participants identified along with the rationale for citing each one.

"Temperature: 70-74 degrees" ($n = 7$) received the most participant responses followed

closely by "Line of Sight: Use of Technology" ($n = 6$). "Acoustics: Access for note

taking" ($n = 3$), "Acoustics: Instructor Microphones" ($n = 3$), and "Furniture: Desks and

Chairs (Separate)" ($n = 3$) made up the middle of the list. "Access: Sit in Any Seat" ($n =$

2), "Lighting: Natural Lighting" ($n = 2$), "Lighting: Dimmable" ($n = 1$), "Line of Sight:

View Content from Seat" ($n = 1$) rounded out the bottom. Additionally, three participants

referenced a feature that was not listed in the top features list; this is labeled "Access:

Exits" ($n = 3$) and refers to classroom exits.

Table 5.5

Summary of Focus Group Participants' Perceptions on Impact of Top Features

Participants	Category	Feature	Examples of Rationale
• Ava • Bailey • Jane • Jennifer • Olivia • Sarah • Zoey	Temperature	70-74 degrees	• Some rooms too cold, too hot, or fluctuate • Prefer more consistent classroom temperatures across campus
• Ava • Bailey • Grace • Jennifer • Mason • Sarah	Line of Sight	Use of Technology	• "No technology" rules can negatively impact learning for some students with disabilities • Clickers negatively impact some students with disabilities
• Ava • Bailey • Olivia	Acoustics	Access for note taking	• Having experienced notetakers is preferred
• Ava • Bailey • Sarah	Acoustics	Instructor microphones	• Better able to hear instructor/distinguish from other noises in classroom
• Ava • Olivia • Zoey	Furniture	Desks and chairs (separate)	• All-in-one desks are too small, uncomfortable

Table 5.5 (continued)

•	Grace	Access	Sit in any seat	•	Unable to access all areas of classrooms with stairs, particularly for group work
•	Olivia				
•	Bailey	Lighting	Natural lighting	•	Natural lighting preferred
•	Jane				
•	Bailey	Lighting	Dimmable	•	Dimmable lighting is fine, but turning off the lights can have a negative impact
•	Bailey	Line of Sight	View content from seat	•	Ability to view projected content is not available in all rooms
•	Bailey	Access	Exits (not listed on slide)	•	Having exits only at the front of a room by the professor creates unwanted attention
•	Jane			•	Some doors lock when you leave a room
•	Sarah				

Temperature. With respect to temperature ($n = 7$), participants shared multiple examples of classrooms that were too cold, too hot, or fluctuate. In one example, Ava described her experience with a classroom in Park Hall where "the A/C just runs in the winter. It's just blowing. It's one of those old ones — it's on the wall. So, it's literally in everybody's face." She continued sharing another example of a classroom that was too hot:

> But I have another room in Aderhold in the College of Ed, which is a newer building. And so, I don't know what's going on with it. It could just be broken. It's where I TA, so it's really hot when you're standing up the whole time.

Sarah described an example of the HVAC systems struggling to adapt to the capacity of an overcrowded classroom saying:

> I have this one class where they cram about 55 of us into a room that's designed for 20 people… And that room usually starts out at like 66 degrees and by the end of it, because there are just so many people in it and it's such a small room, it's

like sometimes. And because there also isn't really much A/C in that building.

And so that… I would agree, kind of, zaps your energy. But, yeah, temperature

isn't really the biggest factor for me.

For Jennifer, temperature was also not a major factor. She explained:

I feel like temperature doesn't really affect me as long as it doesn't… it's not one

of those rooms that has one of those really old radiators that's making a really

loud noise where you can't even hear the instructor anymore.

She continued, "I'm... I can't with those, but other than that temperature doesn't really

bother me."

For other students like Bailey and Zoey, temperature of classrooms is a more

critical issue. As previously discussed, temperature can be a trigger for Bailey's

narcolepsy. She explained, "If a room is too warm, I can't focus. I get sleepy, and I get…

fatigued so much quicker." She continued:

And I also, it happens in the summer, too. So, if I walk in, it's… and it's hot out in

the summer, and I come into a cold room I'm so much more fresh and more able

to stay awake.

In contrast, Zoey experienced symptoms of Raynaud's disease due to Lupus, an

autoimmune disease, in rooms with temperatures that are too cold. She explained:

If I get really cold, it's awful. I have to walk outside for, like, two seconds. When

I get really cold, all of… I will start shivering and all of the blood will start

running out of my extremities — out of my fingers, out of my toes. My hands and

fingers become numb.

She continued:

> I'll start getting Raynaud's inside and it's the middle of the summer just because
> the classroom is freezing. I'm just sitting there — even switching to standing
> didn't help… does not help. I'll still be cold, and then the problem with Raynaud's
> is it can take all of 30 seconds for me to lose feeling and blood in my fingers, but
> it takes, like, five to ten minutes to get it all back.

Line of Sight. Discussion about line of sight ($n = 6$) centered on the use of technology, particularly with respect to note-taking services. According to Olivia, "And I would say that note taking is probably one of the most common accommodations across the board for DRC-registered students." Participants discussed a number of examples of how the use of technology impacted their learning, such as the impact of posting slides and course materials online. Noting that posting course materials online supported her learning, Sarah explained:

> I like it when instructors who post lecture slides and stuff online so that if you're
> not able to absorb the information in class for any reason, then you can go back
> and look at it and have that peace of mind.

Additionally, participants discussed classroom-specific policies on student use of technology as well as the impact of clickers as instructional tools.

Participants indicated that some faculty and departments have developed specific policies related to student use of technology in class. Jennifer and Bailey discussed classroom policies which allowed students to use personal devices, such as laptops and tablets, but only in specific locations in the room. Jennifer explained, "Also, with that, some professors, especially in the science departments, will say, 'Oh, look. If you're

gonna use technology in the classroom, you have to sit in the back two rows.'" Bailey described a similar example saying:

> I've heard of teachers doing, "Okay, the people using technology sit on the left and those who are not sit on the right" Or, if those are larger lecture halls, and so we don't always have those, but that was something that would allow the people to sit in the front as well as all along that… a certain side.

For Jennifer, this policy directly contradicted her accommodation to sit in the front of classrooms. She explained, "…I can't sit in the back rows because I have vision issues, and also for my ADHD it helps to be in the front for me." She continued, "I understand that they have the rules that it doesn't distract others, but it makes it so that people who do have other disabilities and stuff can't do what they need to do."

In another example, Grace described her experience in a class that prohibited students from using technology altogether. As she described, her use of technology stood out in a room where technology was otherwise prohibited:

> The use of technology for me, because a lot of my professors have [a] no laptops rule, and it's under my accommodations to use my laptop for note-taking. So… And I have to sit in the front row with my desk anyways, so everyone is looking at my laptop. Ugh… I just don't like that. So, that's a bigger impact for me.

Both Ava and Mason described similar examples of unwanted attention in classes where technology was prohibited. Ava described being approached by classmates for notes saying, "And I also get lots of people — because I have the laptop — ask me for notes because I have it and… which is fine, but it's not okay if I've never heard your name before…" She continued, "It's a little frustrating that all the attention is put on you. You are known… It's either you or the note-taker -- one of y'all has a disability, you

know?" In Mason's example, he described an event when his instructor forgot he was permitted to use technology. He explained, "I've had one class where they actually called me out for [the] laptop, and I feel like I should have been the one to stand up for myself…" He continued, "But, I feel like it's also a privacy issue that's also going on. Sometimes a professor should take into account, 'Well, there could be a reason why.'"

Finally, participants noted the impact of clickers as an instructional tool in classes. Jennifer noted that clickers posed a significant problem for her saying, "They're stressful, and I get time and a half on exams. I'm used to taking time and a half on questions." She continued, "And I can't finish them in time. It's just impossible. And then my options are either to take zero points for the question or to cheat off of someone, and neither of them are really a good option." Sarah also found the clicker technology used by instructors worked inconsistently as she explained, "My clicker question technology just never works. Like, I would submit a random answer for all the questions, and my submission rate was like 60% because it just doesn't go through."

Acoustics. Similar to the discussion about line of sight, participants primarily focused on acoustics as it related to note-taking ($n = 3$) and use of instructor microphones ($n = 3$). Participants shared examples of challenges with note-taking, particularly when a note-taker is unavailable or not appropriately trained to take notes. In one example, Jennifer shared her experience in a class where a note taker was not available:

> Okay, so when I took PreCalc my first semester here, the professor had a whiteboard instead of a SMART Board, which I understand we can't have SMART Boards in every room or projectors in every room. It's not necessarily feasible. But he would write really messy and really fast and then immediately erase it, and I never had time to work the problems or write it down.

She continued:

> And I just had to go to him every single day after class to have him re-explain
>
> everything. He wasn't willing to work with me, so I just really… There was no
>
> way for me to learn in that class.

> In another example, Ava summarized participant feedback about the lack of note

taker training, saying, "So, it's maybe like one out of four my note takers are great and

the other ones are just subpar." She continued:

> So, if I miss a day of class because of my disability, it really puts me really far
>
> behind as far as that material on the test or something like that. I'm kind of having
>
> to teach myself or get office hours -- which is fine, but it's… it just makes things
>
> a lot more difficult.

Mason added that note takers were not always prompt to return class notes to students.

He explained, "It's also a timeliness thing. Or, I mean, I've had a note taker who literally

gave me all of her notes the day before the test."

The discussion about note takers in both groups generated ideas toward resolving

the issues participants encountered, including developing online training for note takers.

Ava suggested, "Even like a video or something on YouTube that they were required to

watch." She explained, "I'm a president of an organization here, and in order for us to be

an official UGA-sanctioned organization we have to watch training videos and then take

a quiz based on the videos."

In the second focus group, Bailey suggested introducing digital tools such as

Evernote or Google Slides to share notes in real time as a way to improve timeliness. She

explained the benefits of using such tools saying, "I could watch it [the notes] come up as

she's typing it, and then I don't have to download it and everything." Jennifer agreed, "That would be *so* convenient!"

Mason and Olivia suggested developing systems for reporting and tracking positive and negative experiences with note takers. Mason said:

> So, I mean, I feel like access to note taking needs to be improved in a way that, you know, if we have to complain to, say, the DRC, the DRC can say, "Well, you know what? This is the problem and this is the consequence."

Olivia suggested developing ways to share feedback for existing note takers and vet new potential note takers saying:

> Or maybe even setting up a system of verified note takers. We know these people's notes are good. And new note takers, you want to take notes for a class, maybe you give an example of your notes for one class, and they determine, "Oh, yeah! You're a good note-taker. You're verified and can note take for whatever classes you're in." Just something to keep track of, "Okay. Yes. You're actually a good note taker."

Participants also shared examples related to instructor use of the microphones, particularly the benefits associated with microphone use and challenges associated with instructors trying to set up and use the equipment. Ava pointed out that when instructors do not wear microphones, it can be difficult to follow along in class:

> I'm slightly hard of hearing in one ear, so if I can't hear what the professor's saying or they're turned towards the board and they're saying something and I don't catch it, I don't have a way… I just… And then I'm stuck in the front, so I don't have anybody. I'm always the only one in my row or just up the professor's nose. So, I don't have anybody around me to ask.

This was echoed in the second focus group as Sarah explained, "I really like when instructors have microphones because it helps my brain to pick their voice out of any other noises that are going on and just focus on that."

Bailey noted in the second focus group that setting up microphones posed some challenges for instructors trying to use them. She explained, "Sometimes the microphones pop and scream…" She continued, "But I do prefer teachers to have microphones, but if they could get them set up before class…" Bailey pointed to a potential training issue as a root cause saying, "So, I think almost that's maybe more training for the professors of how to use the devices in the building." She continued:

> Because I know so many teachers that they get there and they're like, "I don't know how to use this!" And you're like, "Help? You've been teaching for a few years." You know, but then again, it's just, I guess, educating them.

Furniture, Access, and Lighting. Nearing the bottom of the list, there was some continued discussion about student furniture related to desks and chairs ($n = 3$), access and students' ability to sit in any seat ($n = 2$), natural lighting ($n = 2$) and dimmable lighting ($n = 1$), and line of sight ($n = 1$) to be able to see content from seat. As previously discussed, furniture size and comfort were specific pain points, particularly in the first focus group. Additionally, the location of accessible seating or DRC-provided desks coupled with the lack of ramp access limited participants' ability to access all areas of the classroom and the ability to participate in group work activities. As Grace described:

> …to sit in any seat because I do have to sit in my desk up — right up the professor's nose, basically. <chuckles> Because there's never space for one of those [DRC-provided accessible] desks to be put… So, a lot of my classes are

group work and that sort of thing, so I don't get that interaction because no one sits by me because no one wants to really sit in the front row anyway. So, I have to call people in the back or something.

In terms of lighting, Bailey and Jane discussed the negative impact of both turning lights off completely and incorporating bright lights in classrooms. Bailey described the problem with turning lights off in a classroom saying, "I don't know how anyone can stay awake in a dark classroom when you're watching this [video], let alone someone with narcolepsy." She continued, "So, even if it's just turning one light off in the front versus in the back, or you know, just the dimming the lights is better."

When discussing the impact of bright lights, Jane explained, "…the lighting it's *such* a *huge* thing for me." She continued, "Like the very, very bright lights — they're kind of stressful, and I think it's associated with maybe like… well not only just the, you know, nature of epilepsy, but also, it's reminders almost of hospitals and stuff like that." Both Jane and Bailey preferred natural lighting, as Bailey explained, "I guess just that natural light, it doesn't give me a headache as quickly versus the fluorescents."

Access to Exits. Finally, a feature not included on the presented list was discussed by participants in the second focus group. As previously discussed, this was coded as "Access: Exits" during analysis. Bailey, Jane, and Sarah each discussed their preference for access to multiple exits in classrooms — particularly in areas where leaving a room briefly would not be disruptive to the class. Sarah explained, "For me, the setup of the room makes a difference. I really don't like classrooms where the only path of exiting is to go sort of like, if it's a lecture hall, to the front and then past the professor sort of…" She continued:

It just draws a ton of attention to yourself because, especially during the really

long periods – like the 75-minute ones [classes] on Tuesday-Thursday, sometimes

I need to take a break if my brain gets overwhelmed by the noises of the

classroom and that gives me some anxiety. So, it's nice to be able to step out and

take a break. But if the room is set up in such a way that that's not feasible, then

that would negatively impact my learning, I'd say.

This example resonated with Bailey, too. She described a similar challenge saying:

…I'm the same way. If I'm dozing off in one of those longer lectures, I can't get

up and leave because it's the only path is past the teacher. Or even just get up and

grab some water, or I can't leave the room because I know... Well, I can, but it's

just so much more of a scene, and... and then... still half of the time the teacher's

like, "Well, where you going?" If they say something, but I... Normally my

teachers know, but, you know, just the snide comments aren't nice either.

Jane pointed out that even if you do make the decision to exit the room, some classrooms

are locked prohibiting re-entry.

Response Summary. For most participants, the top categories identified by the

survey participants connected with focus group participants. There were a number of

examples shared throughout the discussion even if the perceived impact for the focus

group participants differed from the overall survey results. In the second focus group,

participants identified having access to multiple exits as a feature that lacked

representation. It was not a feature listed in the survey, but participants perceived it as

one that should be added.

Classroom Types that Facilitate Learning

Next, the focus group participants ($N = 10$) were presented with a third slide titled "Classroom Examples" (see Figure 5.3), which presented three typical classrooms found at UGA. These classroom examples included a lecture hall with stadium-style seating and two general assignment classrooms, one with tables and chairs and the other with desks and chairs. Focus group participants were asked what types of classrooms they found facilitated their learning, and most ($n = 8$) responded with their preferences which are summarized in Table 5.6.

Figure 5.3. Classroom design examples used to identify features that support learning.
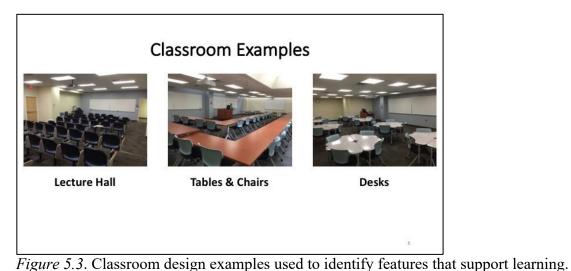
Table 5.6

Summary of Classroom Types that Facilitated Focus Group Participants' Learning

Participants	Classroom Type
• Anika	Tables and Chairs
• Ava	
• Bailey	
• Jennifer	
• Mia	
• Olivia	
• Jane	Desks and Chairs
• Jennifer	
• Sarah	
• Anika	Lecture

Tables and Chairs. Participants in both focus groups preferred tables and chairs ($n = 6$). Flexibility in seating arrangements, personal space, and access were most commonly cited as supporting participants' selection. Olivia, having weighed the three options, stated in the first focus group, "So, out of these options, I think tables and chairs would probably be the best option for me, personally" In another example, Bailey shared in the second focus group, "Yeah, there's a lot more room under tables and chairs. I also love the availability of that raised desk because, for me, if I could stand during class and not it be super obvious, that would be ideal." As previously discussed, many of the comments in support of tables and chairs aligned with the discussion about the use of tables and chairs in updated lecture hall designs.

There were participants who shared examples of tables and chairs that could negatively impact students. In the first focus group, Mia shared her experience in a classroom that used a conference-style table and chairs. As she described, the setup was not conducive for learning:

> I have one class now that is in this tiny room — probably half the size, maybe less — and it's just one long conference table with chairs. The projector's there [points to front of room] so I'm facing this way [turns body 90 degrees], and I have to go like this [turns head 90 degrees to face the front] the whole freakin' hour and 15 minutes.

She continued, "So, sometimes this one poor girl has to sit in a chair facing everyone else and not the thing [projector] because there's not enough room for all of us to fit in that room."

Desks and Chairs. Desks and chairs ($n = 3$) received some favorable feedback. Participants cited more personal space and flexibility of seating arrangements as two

main factors that appealed to them. In the second focus group, Sarah explained, "I think I would prefer the desks model because it just gives you more physical space in between people, which is better for me with my auditory issues." From a different perspective, Bailey suggested desks and chairs better-facilitated group work:

> EDIT 2000, it's very project oriented. That would have been ideal for that class just because the desks would have been ideal for the class because it's a project-oriented classes, I think, would be great for that as well as if you're working on, you know, collaboration and discussion and stuff. I would definitely go for that proponent. So, if you could have classrooms that are like, "Oh, these are for project-based classes" versus "This is for lecture hall."

Although desks and chairs received more positive feedback, some participants responded with caution.

For Olivia, desks and chairs created additional challenges that might go unnoticed by most classroom users. She explained her concerns in the first focus group:

> I really like the idea of desks and chairs, but that kind of style is really difficult to access with a wheelchair or walker. And it also causes a lot of issues with things like line of sight and hearing the professor because not everyone is necessarily facing the front of the classroom. If the professor is walking through, it'd be difficult.

This feedback was echoed by Jane in the second focus group, who said:

> I think I really like the versatility of the desks. Just having the ability to change it based on if we're doing projects or… But I definitely think it needs to be changed appropriately because I think sometimes professors will just keep it the way it is. Whereas, if it is set up that way in circles and professors walking around, I'm

more prone to follow them, you know, and watch them. And that gets really hard

because then you can't take notes. You're, you know, looking around.

Jane added, "Yeah, so I think the desks would probably work best, but only if they're

used appropriately depending on the day – which takes effort."

Lecture Halls. Only one participant favored lecture halls. Most participants (n =

7) who responded did not prefer lecture halls, citing the inadequate student furniture, lack

of personal space, and insufficient aisle space as major factors for their opinions. Olivia

stated in the first focus group, "I think, lecture hall -- the whole attached chair/desk thing

– everyone hates that." Ava confirmed, "It's gotta go." Ava later described her negative

association with lecture halls based on her experiences saying:

> One of the classrooms is set up like the lecture hall, but you can't move it. It's all
>
> in a row, and you can't move the chairs. And I have no idea if somebody had a
>
> wheelchair how they would even fit in between because I can barely fit just as a
>
> body, just walking. You can't fit in between when the desks are out. I mean, you
>
> just. I don't even think you could fit if the desks were down, but… It's just very
>
> tight.

This sentiment was echoed in the second focus group. Jennifer explained, "I prefer tables

and chairs just because lecture hall, I don't know, being that close together with

someone… I don't know. Sometimes it just… it's not good for distractibility and just a

bunch of other issues." She continued, "I'm in Guide Dog Foundation. Sometimes I'll

have dogs, and if it's a big dog and the seats have, ooh, this much foot space, there's no

way you can put a dog there." To which Bailey added, "And your backpack." Later,

Bailey added, "I *don't* mind lecture halls as much, but for me, it goes back to the space."

There was one notable exception to the negative associations with lecture halls. Anika introduced an updated lecture hall design in the first focus group saying:

> I don't know if you guys have seen the SLC [Science Learning Center]? For me, personally, that's the best setup because it's a combination of a lecture hall and tables and chairs in the sense that it's kind of stadium-style so that everybody can see, but the aisles are huge. So, for me, trying to get through people in a tiny lecture hall is very hard because I don't have the best balance. So, that setup works well. I'm pretty sure they have a ramp of some kind.

Anika continued describing the chairs, which had casters and could swivel in place, "They even have the twisty chairs which is such an easy fix, but it's perfect for group work." Several were familiar with this classroom design, but it was a new design concept to a few in that first focus group. In total, about half of the participants ($n = 5$) spoke in favor of this lecture hall design as it supported both lecture and group work instructional activities as well as addressed their accessibility concerns related to student furniture, access, personal space, and technology.

Suggestions for Designing Classrooms

Focus group participants ($N = 9$) were then presented with a series of three slides with each classroom design (i.e., lecture hall, tables and chairs, and desks) individually presented. This was followed by a new design for a SCALE-UP or Active Learning classroom design. For each classroom design type, participants were asked what were the ideal features for their learning. To encourage participants to think beyond what was presented visually on the slide, the question was rephrased, "If money was no object, how would you design a [classroom example]?" substituting "lecture hall," "a classroom with tables and chairs," "a classroom with desks," or "a SCALE-UP or Active Learning

classroom" depending on which slide was projected. Responses from participants tended to build off one classroom design to the next or statements made previously in the focus group, but some distinctions were made and are noted in this section.

Lecture Halls. For lecture classrooms (see Figure 5.4), the features that emerged from the discussion included access ($n = 4$), furniture ($n = 3$), lighting ($n = 3$), and acoustics ($n = 1$) which are summarized in Table 5.7. The first focus group, in particular, gravitated toward the lecture hall design used in the Science Learning Center, which includes two rows of fixed, curved tables situated on each tier, soft chairs on casters the swivel, wide aisles, and ramp access to the front and rear of the classroom.

Figure 5.4. Lecture hall example used to identify design features that support learning.

Table 5.7

Summary of Suggested Lecture Hall Features

Participants	Features	Examples of Rationale
• Ava • Olivia • Jennifer • Sarah	Access	• Aisle space • Ramp access to all areas of the room • Exits distributed around room • Room exits to elevator or accessible building exit • Building housing lecture hall is accessible

Table 5.7 (continued)		
• Bailey Furniture • Jennifer • Sarah	• Bigger desks for students • Tables • Choice between tables or desks • Folding tray desks	
• Bailey Lighting • Jennifer • Sarah	• Natural lighting from windows • Shades	
• Bailey Acoustics • Jane	• Acoustical treatments and technology to facilitate lecture	

Access. The features participants noted as facilitating access (*n* = 4) in lecture halls were ramps, wide aisles, and multiple exits distributed around the room. A particular point of discussion in the first focus group was building access and ensuring lecture hall exits provided access to elevators or accessible building exits. As Ava explained, there were lecture halls in use on campus that did not always exit to an elevator or accessible building entrance:

> There's [*sic*] two doors depending on where you enter or exit from. So, if you're at the top there will be a door to exit from the top of the auditorium. And then, if you're coming in or out of the ones that are at the bottom – like if you're not up the stairs, but you're down the stairs – sometimes when (depending on which way you exit) there will or won't be an elevator accessible to you.

Olivia added that several buildings were either not accessible or the accessible entries were not easily found saying:

> …that's true for a lot of buildings on North Campus. I love North Campus. It's beautiful, but there are several older buildings up there that just aren't built with accommodations in mind. So, they're not very easily accessible. And even try… even if they have a handicap accessible entrance, it's tucked around the back…

the back of the building hidden by foliage and shrubs and you have to hunt to find

the entrance.

Ensuring appropriate and well-marked access into and out of buildings housing lecture

halls was preferred.

Furniture. In terms of furniture ($n = 3$), participants made several suggestions

intended to improve personal space. Bigger desks or the use of tables were primary

suggestions. Jennifer explained, "Okay, sometimes I want to have my notebook and my

computer out at the same time so that I could take notes, look at the lecture slides."

Similarly, Sarah noted:

I like a table. Have you ever been to… where is it? Davison? The big lecture halls

in Davison? And then it's half and half: the front half has tables and then also

chairs, kind of like that, and then the back half has, sort of, the traditional foldy

[*sic*] thing. I like the table set up more because it's still pretty space-effective

because you can fit a lot of people there like just as many as you would, but you

have a much more room to write.

The concept of a mixed furniture classroom design appealed to Bailey, who followed

saying, "I think that's nice having that variability because then those people who like the,

you know, lecture – smaller desks – that's fine. If they know they're just using their

computer or one notebook or being able to spread out." Bailey also suggested the use of

folding tray tables (similar to those found on an airplane) to allow more work surface

space for lecture hall desks.

Lighting and Acoustics. Finally, participants noted that lecture halls with natural

lighting ($n = 3$) and good acoustics ($n = 1$) were preferred. Participants in the second

focus group pondered why they selected natural lighting, noting it did not have a direct

impact on their disabilities per se. Sarah stated, "It doesn't directly affect me in a way that's related to my disability, but I think it affects the overall atmosphere of the class. It makes it less pleasant." Jennifer added:

> I agree. I'm very affected by the weather which… whatever… But when I'm in a room where there's a lot of light coming in, it… it impacts, not only my mood, but my ability to focus because if I… if there's no light and I know that it's just dark and gloomy outside and there's just everyone in the room was upset about it and… I just won't be able to focus. I'll just be thinking about how bad the environment is. It's just having the natural light. It's just even… when it's dark gloomy outside — it just it helps.

When asked about issues related to projection and glare, Bailey suggested incorporating shades:

> …if the teacher knew how to use them. That… that was helpful 'cause I could keep… he could put the shades down halfway and then the floor-to-ceiling windows still brought in some of that light. And so, he didn't have to put the shades down all the way if you didn't want to, but it sometimes can affect it.
>
> With respect to acoustics, Jane provided an example of a lecture hall with poor

acoustics that negatively impacted the instructional activities in the class. She explained, "…the acoustics are awful and we have a teacher that is very… Well, she teaches audiology, so she's very aware of just how important it is to have good acoustics." She continued:

> She's aware of that, probably because of her profession, but also if they [the administration] were to make other professors aware of that. And also, just

redesign the room because it's the way the sound is absorbed is really hard to hear from different points in the room.

Bailey added that it was easier to hear the instructor microphone and classmates when seated at the front of the room Jane described. This example demonstrated a preference for lecture halls with appropriate acoustical treatments and technology, like instructor microphones, to facilitate instructional activities.

Classrooms with Tables and Chairs. For classrooms with tables and chairs (see Figure 5.5), line of sight ($n = 5$) and furniture ($n = 2$) were the two primary classroom design features that emerged, but the rationale for each feature was often intertwined (see Table 5.8). For example, participants indicated it was important to see both the instructor and fellow students. Mason suggested using a more curved table formation to facilitate line of sight:

In terms of line of sight, just looking based off this picture that you're showing, I would try to maybe curve it more to where we can actually see the professor more naturally rather… This is coming from a perspective of a deaf individual where we see sharp edges as more like… there's always going to be that one person missing. Whereas, if you curve it, it's more inclusive and people can adjust to themselves just fine. I just… I think that's kind of important.

He added, "And, I mean, the style that I'm kind of like putting out there is actually implemented over in Gallaudet University in Washington, D.C."

Figure 5.5. Tables and chairs example used to identify features that support learning.

Table 5.8

Summary of Suggested Features in Classrooms with Tables and Chairs

Participants	Feature	Examples of Rationale
• Ava • Jane • Mason • Mia • Olivia	Line of Sight	• Ability to see instructor • Ability to see fellow students • Instructor podium situated so it does not block projected or whiteboard content • Appropriate technology and whiteboard use
• Bailey • Sarah	Furniture	• Curved table setup • Chairs on casters that swivel • Personal space

Incorporating chairs with casters that swiveled also facilitated line of sight. Participants indicated the curved table formation with swivel chairs allowed participants to shift in their seat or turn their head slightly to view classmates more easily. As Mason stated:

Or, there's that and there's [*sic*] people behind you and they're talking. If it were more curved out it would have been... all I can do is [swivels in seat slightly], "Oh, okay. I can see you now!" Or somebody can adjust themselves if you ask them to or something like that. I feel like it, I mean, in a classroom setting like

that, it becomes a little bit more… organic? Or, conversations are organic rather than sharp edges that goes around the professor.

Participants also indicated swivel chairs facilitated their ability to stay focused in class and control their personal space. As Bailey described:

I like that I can move and I can be busy and not be super distractive to other people. Because in a lecture hall with the desks sitting there, I can't twist or just try to do things that keep me awake. Or even moving back and forth. And sometimes these chairs, you can lean back a little bit and rock a little bit, and I do like that aspect of it.

Sarah added, "I also just really like the mobility of the chairs. You can control your distance from other people a little bit more."

The placement of the instructor podium and use of available classroom technology was another discussion point related to line of sight. Olivia noted:

Also, another thing, the way the desk is set up with the computer and the document scanner and everything, normally it is situated towards the side of where the whiteboards are. And that's a pretty consistent issue that I, and I know a lot of other people, have in classes that when you're sitting in the front row on ground level, if the professor is starting to write lower on the board, you can't see what they're writing because the way the computer and all the hardware up there is… it cuts off the line of sight.

Ava noted that the placement and use of the whiteboards were problematic, saying "if you're on one side and your professor's all the way over here and that's the one that they choose to write on… you have no idea what they're writing."

When asked if instructors used the document cameras in classrooms to project handwritten content digitally on both screens instead of using whiteboards, participants in the first focus group indicated few faculty knew how to use the technology. Olivia, Ava, and Mia had not seen the document cameras used, as Mia stated, "I've never seen that." Mason had seen the document cameras used, but said, "I feel like even though it's available for the professors to use, not every professor likes it. I've seen them fight it. I've seen one actually break one." Olivia also suggested the technology might create barriers for some faculty saying:

> Also, some of my professors… that requires adeptness with technology, and some of my professors have a hard-enough time projecting their slideshow up onto the screen. They're struggling with the technology, so I think maybe having programs that they go through. "Hey! This is how you use this technology." I think it's super intimidating for some of them, especially the older professors.

Classrooms with Desks and Chairs. Participants identified line of sight ($n = 5$) and access ($n = 2$) as the two primary categories for classroom design features that should be incorporated to facilitate learning in classrooms with desks (see Figure 5.6). Discussion centered on the ability to view the instructor and instructional content from the student desks. There was also discussion about features and issues that impact access to student desks. Table 5.9 summarizes participant feedback related to features supporting learning in classrooms designed with desks and chairs.

Figure 5.6. Desks and chairs example used to identify features that support learning.

Table 5.9

Summary of Suggested Features in Classrooms with Desks

Participants	Feature	Examples of Rationale
• Ava • Bailey • Jane • Jennifer • Sarah	Line of Sight	• Ability to see instructor • Ability to see whiteboard content • Use of multiple screens to view projected content from any seat • Resolution/text size of projected content
• Bailey • Olivia	Access	• Aisle space • Class size • Availability of outlets for student devices

In the first focus group, participants identified specific challenges with the layout presented in the example picture and suggested the ability to see the instructor, whiteboards, and projected content is key for lecture-based classes. As Ava pointed out, "The first thing I'd improve is people's backs to the professor. Or to the board. That makes no sense." She added:

It would be great in concept for group work, but only if the professor was just giving instruction. Everybody would have to turn around. If you're deaf or hard of hearing, you couldn't necessarily see the professor… I don't see how this could work in a way that any professor needed to lecture and talk about things.

Olivia added that the configuration of the desks in the example posed specific challenges for accessing the room, suggesting aisle space and class size should be considered when configuring desks:

> Also, this picture… just looking at it kind of gives me anxiety. Just… this is like a minefield. There are no aisles, the way the chair legs come out. I could not get through that with my wheelchair. It's just not accessible, so it would definitely have to be designed in a way that… while also taking into consideration line-of-sight, making sure everyone can see the professor, and hear him, but making sure that…

She continued, "I feel like the classrooms here… it's like we're gonna try to cram as many people into a small space as we can." Further emphasizing the importance of aisle space, Olivia suggested, "And for a setup like this, you have to put less in there to ensure that the aisles are wide enough to be accessed from wheelchair, walker, if you're on crutches, or use a cane."

In the second focus group, Bailey indicated outlets would be a helpful addition for classrooms with desks and chairs saying:

> I think the lack of outlets is a huge thing. That is something that's really, for me, using my computer all the time… if there's not an outlet and my computer's at 10%, I will miss a lot of the learning because my computer's gonna die.

She went on to describe an example of a classroom in Dawson Hall where she chose her seat based on its proximity to an outlet along the wall.

Jane suggested that the desk layout as presented might facilitate group work, but she suggested adding more projection screens or monitors throughout the room saying:

I think if you do have the desks that are able to… like that… to get into circular

tables… to maybe have not only just an option for a screen in the front, but also

maybe have some in the back so that now the people who are facing backwards

had access to whatever the teacher's putting up on the board.

She added, "And just having that there. Maybe it can come down, you know, pull down

or whatever just on those days that they are in circles so that, you know, both sides can

see."

Sarah agreed with this suggestion, adding that the size of the projected content

was equally important, "…I was basically going to say what you said about having lots of

different screens… But then also being mindful of the size of the screens…" She

continued by describing her experience in a SCALE-UP classroom at the Science

Learning Center saying:

And they're great because they have TVs and stuff, but sometimes the TVs are

much smaller than the projector screen. And so, it's impossible to read the text

size even if you're pretty close to one of them. So, even if you do have so many of

these screens, it doesn't help if you can't read any of them.

Bailey wondered in response to Sarah's feedback if interactive whiteboards (e.g.,

SMART Boards) might provide a good option for screen size and support of group work.

In contrast, however, Jennifer disagreed with the suggestion multiple monitors would

resolve line of sight problems saying, "I just didn't have a good experience in that

classroom just because I didn't know where my professor was, the notes were all over the

place, and it just… it… it just didn't work out for me."

SCALE-UP or Active Learning Classrooms. Focus group participants ($N = 9$)

were presented with a final classroom design example (see Figure 5.7). This classroom

was of a specific type of active learning classroom, called SCALE-UP, which was recently established in the Science Learning Center at UGA. After briefly describing the purpose of the design and its intended use, participants were asked whether this type of classroom facilitated their learning. Modeling after the previous classroom design questions, participants were also asked what were the ideal design features for their learning in an active learning classroom. Participant feedback is summarized in Table 5.10.

Figure 5.7. SCALE-UP example used to identify features that support learning.

Table 5.10

Summary of Suggested Features in SCALE-UP or Active Learning Classrooms

Participants	Feature	Example of Rationale
• Ava • Bailey • Jane • Mason • Olivia	Furniture	• Tables facilitated group work • Chairs on casters that swivel
• Mason • Mia • Sarah	Acoustics	• Proximity to group members
• Mason • Olivia	Access	• Personal space • Wide aisles • Ability to sit in any seat (wheelchair accessible)

Table 5.10 (continued)			
• Mason	Lighting		
• Jennifer	Line of Sight	•	Ability to see instructor
		•	Ability to see projected content

In the first focus group, Mason, who had a hearing impairment, was the only participant who had attended classes in a SCALE-UP classroom. He described his experience saying:

> Yeah, so I feel like the only issue I've ever had in a classroom like that was when a professor's talking and, myself, I forget where... Like, "Oh wait! The professor's behind me. I've gotta go ahead and turnaround." Which is not too much of a big issue for me…

He continued by describing instructional activities were hands-on (not lecture-based), and the physical make-up of the classroom:

> So, I mean, I actually like the structure. The lighting was great. In terms of line of sight, maybe not a good place to do your lectures in… I felt like there was also a lot of space. I never felt the need to, you know, jump over my peers' book bags. When I took the class, there were three people who had guide dogs in training, and you know, the guide dogs literally… was [*sic*] able to navigate their way through without, you know, looking at something like, "This is an object in my way." And so, it was relatively easy and the space was used pretty well.

This focus on group work was appealing to several participants; Olivia summarized this saying:

> That's a really interesting alternative, though. Maybe if you're having a three day a week class, having your lectures in a room more suited for that kind of setup

and then, on whatever day you're doing the bulk of your group work, doing a

classroom like this.

She continued, "Because then you're able to access the whole room, the group that you

need to talk to you is all at one table. You can all see each other." The design of the

classroom and the furniture facilitated access, particularly for wheelchair users. As

Mason described:

I would assume maybe for someone who's using a wheelchair, all you have to do

is just move the chair and you can, honestly, go right there and you don't have to

worry about, you know, that one leg of this whole table.

The chairs used in the room were a concern for some users. Ava asked Mason,

"Did it have roll-y, swivel chairs? Or was it like those chairs?" To which he responded,

"No." Ava suggested that replacing the chairs "would be the only thing I would improve

upon."

Mia expressed concerns about the acoustics in such a classroom saying:

The only problem I can see with it in my point of view is I have an auditory

processing problem. So, if there's [*sic*] nine people talking, that would be super

horrible for me in that one small area because I wouldn't be able to really catch

any good information from those… [around me].

Mason responded that he personally did not find the acoustics in the room to be a

challenge. He found the instructor spoke up to ensure people could hear in the back of the

room. Mason also described the design features at the table as aiding with acoustics

saying:

I felt like the [desktops] were kind of my barriers from hearing the people across

the table. So, that honestly really helped in terms of how sound works… Yeah,

there's a small pillar… So, that helped block out the sound coming from people

that you don't want to hear from.

In general, participants in the first focus group found the SCALE-UP classroom

facilitated their learning.

In the second focus group, most of the participants ($n = 3$) had previously

attended a class in a SCALE-UP classroom. Feedback was more mixed than in the first

focus group. Participants shared both positive and negative experiences, indicating

instructional used played a role in their opinions.

Sarah had a very positive experience in the SCALE-UP classroom and indicated

the room's design supported her learning and individual needs better than a lecture hall

saying:

I really enjoyed my class that I had in this room… And I learned so much more in

this room partially because lecture halls are just inherently difficult for me to

separate out the noise of the professor speaking and all the noises around me and

they're just all amplified – especially if there's bad acoustics in the room.

Sarah also found the room's design facilitated group work:

And so, group work is much easier for me in this kind of setting – definitely, it is

designed for that – because the people who I'm listening to and talking to or right

next to me instead of separated by all these other people.

In contrast, Jennifer did not have such a positive experience. Line of sight during

the lectures proved to be a significant issue, as she described:

I liked the group work aspect because I do work really well in groups. But I don't

know how to explain it. There's no good spot in the room for me to have a good

sight… view of the professor while also having a good view of a screen.

She continued, "So, I can see where for a lot of people that would work really well, but for me, personally, it just it makes it difficult to learn during the lecture part."

Bailey focused on the instructional use of the SCALE-UP classroom in her response. "I think for group work, it's really great and for classrooms that are designed… the classes that are designed that way." But for Bailey, group work was not commonplace as she explained, "My classes for the Communication Sciences, we didn't have that many group-type project stuff going on. And so, when we had to collaborate, it was really hard in the… in the lecture style to do that." Even more unfamiliar was the concept of large group work, "So, I think that from me, the thought of the nine people and then both three… then three groups at a table, and then you all collaborate? That's a lot of bodies and collaboration…"

Jane was the only participant who did not have prior experience with a SCALE-UP classroom, but she saw opportunities to facilitate her learning. She explained, "This definitely looks really appealing to me for a few reasons. First, if I know that I'm in a group and we're gonna have the ability after the professor talks or whatever to talk together, it's way more engaging for me and then also just to stay focused." Jane also viewed the classrooms as an opportunity to foster more community between students in her major. She explained, "I know in our cohort we have quite a bit of people — it's anywhere from 55 to 70 — and we always kind of kid around with each other that we really never get to know anyone." She continued, "So, I think that would definitely make a classroom put people more at ease, just knowing their peers a little bit better and then also finding the chance to really engage."

Favorite and Least Favorite Classrooms

At the conclusion of the focus group, participants ($N = 9$) were asked to share examples of their favorite and least favorite classrooms on campus. They were also invited to share final thoughts about how classroom design impacted their learning. Finally, participants were provided an opportunity to ask any remaining questions about the study. A placeholder slide was used to facilitate this discussion.

While a number of classroom examples had been shared during the focus group discussion, participants were asked to narrow their selections down to one or two examples of their favorite or least favorite classrooms at UGA. The list of classroom examples discussed by participants is summarized in Tables 5.11 and 5.12.

Table 5.11

Summary of Participants' Favorite Classrooms

Building	Classroom Type	Participants	Examples of Features and Rationale

Science Learning Center	Lecture Hall	• Anika
		• Mason
		• Mia
			• Access
			  - Wide aisles
			  - Better ramp access
			• Furniture
			  - Large tables
			  - Chairs on casters that swivel
			• Facilitate instruction
			  - Lecture
			  - Group work

Table 5.11 (continued)

Correll Hall	Desks	•	Bailey	•	Facilitated Instruction
					  - Furniture set up in different configurations based on class activities
					• Furniture
					  - Desks
					  - Chairs
					• Lighting
					  - Natural light from floor to ceiling windows
					• Technology
					  - Three projection screens

Gilbert Hall	Table (conference style)	•	Jane	•	Acoustics
					  - Soundproof once door was closed
					• Facilitated instruction
					  - Students faced each other
					  - Facilitated talking across table and to each other in Spanish class
					  - Facilitated instructor support

Miller Learning Center	Lecture	•	Olivia	•	Furniture
					  - Curved tables
					• Line of sight
					  - Low stage tiered seating

Park Hall	Desks	•	Jennifer	•	Access
					  - Close proximity to other students without feeling overcrowded
					• Line of sight
					  - Instructor movement was always visible

Table 5.11 (continued)

Sanford Hall	Lecture	•	Ava	•	Facilitates instruction
					- Group work
					- Lecture
				•	Furniture
					- Curved tables
					- Chairs on casters that swivel
				•	Lighting
				•	Line of sight
				•	Technology
Science Learning Center	SCALE-UP	•	Sarah	•	Acoustics
				•	Facilitates instruction
					- Group work

Table 5.12

Summary of Participants' Least Favorite Classrooms

Building	Classroom Type	Participants	Examples of Features and Rationale

Aderhold Hall	Lecture	• Bailey
		• Jane
			• Acoustics
			• Line of sight
			  - Students in back unable to see bottom of the projection screen
			  - Instructors unable to see students in back of classroom

Peabody Hall	Desks/Tables	• Anika
		• Olivia
			• Access
			  - No elevator
			  - Fallen down stairs
			• Furniture
			  - Conference style

Table 5.12 (continued)

Biological Sciences Building	Lecture	• Mia	• Access
			  - Small aisles
			• Furniture
			  - Small desks
			• Line of sight
			  - Room is situated at a sharp angle that causes neck strain if you sit in front
			  - Too far if you sit in back

Chemistry Building	Desks	• Mason	• Acoustics - Bad echo

Davison Life Sciences	Lecture	• Mason	• Access
			  - Wheelchair accessible seating is in a balcony separated from the rest of the class
			• Acoustics
			  - Pillars can block sound
			• Line of sight
			  - Pillars that impact line of sight

Miller Plant Sciences	Desks	• Sarah	• Acoustics
			• Furniture
			  - Tablet desks
			• Lighting
			  - No windows
			• Line of sight
			  - Long room ("like a hallway")
			• Other
			  - Paint color bright white
			• Temperature
			  - Fluctuates

Table 5.12 (continued)

Park Hall	Desks	•	Ava	•	Furniture
					- Small desks
				•	Temperature
					- AC unit blows directly on students in winter
Physics Building	Lecture	•	Jennifer	•	Access
					- Small aisles
					- Inadequate personal space
				•	Acoustics
					- Unable to hear from back of room
				•	Line of sight
					- Unable to see from back of room
				•	Other
					- Old and outdated
Warnell School of Forestry	Desks	•	Bailey	•	Access
					- Inadequate personal space
				•	Other
					- Low ceilings
				•	Temperature
					- Too warm

Favorite Classrooms. Most participants ($n = 5$) selected examples of their favorite lecture halls on campus. The new lecture halls in the Science Learning Center were selected most frequently ($n = 3$), but both the Miller Learning Center ($n = 1$) and Sanford Hall ($n = 1$) were cited. Classrooms with desks ($n = 2$) followed next, with Correll Hall and "smaller classrooms" in Park Hall receiving positive feedback. Finally, the Science Learning Center SCALE-UP classroom ($n = 1$) and a conference room in Gilbert Hall ($n = 1$) rounded out participants' list of favorite classrooms.

There were a number of features participants highlighted to support their favorite room selections. Student furniture ($n = 7$) was cited most frequently, with participants describing large or curved tables ($n = 3$), chairs with casters that swivel ($n = 3$), and desks ($n = 1$) that could be configured in different seating arrangements. Classroom designs that facilitated instructional activities ($n = 5$) were also popular with participants, particularly lecture and general assignment classroom designs that facilitated both lecture and group work activities. Access ($n = 3$) and line of sight ($n = 3$) were tied; participants described classrooms with wide aisles, better ramp access, and appropriate personal space as well as classrooms with good visibility of both the instructor and instructional content.

Least Favorite Classrooms. Participants had a harder time narrowing down their least favorite classrooms to just one example. A lecture hall in Aderhold Hall ($n = 2$) and classrooms with desks on the second floor of Peabody Hall ($n = 2$) were cited most. The remaining rooms on the list were cited once each. These included lecture halls in the Biological Sciences building, Davison Life Sciences, and the Physics building. They also included rooms with desks in the Chemistry building, Miller Plant Sciences, Park Hall, and the Warnell School of Forestry.

Participants listed a number of features that supported their selections for least favorite classrooms. Access ($n = 5$), acoustics ($n = 5$), and lines of sight ($n = 5$) were cited most frequently. Participants complained about the lack of elevator access in Peabody Hall and uneven stairs in the stairwell that caused one participant to fall. In Davison Life Sciences, they indicated the only wheelchair accessible seating in one room was in a balcony, separated from the rest of the class below. They also cited small aisles and lack of personal space as limitations in selected rooms.

Conclusion

The results of the focus group provided some interesting context around the survey results. The demographics of the focus group participants more closely aligned with the survey participants and overall undergraduate student population served by the UGA DRC following the recruitment of a second focus group. This second focus group targeted participants with invisible disabilities that represented the population's majority disability categories.

Focus group participants reviewed the results of the survey, and feedback suggested that the impact of classroom design features on their learning is relative to the needs of the individual. In contrast to the survey results, the features that focus group participants identified as impacting their learning based on their individual experiences and needs include furniture, access, acoustics, lines of sight, lighting, and temperature. They also identified a number of features that support their learning. These include temperature, line of sight, acoustics, furniture, access, lighting, and access to exits.

With respect to classroom design, feedback from participants suggested that classrooms designed with tables and chairs facilitated their learning better than classrooms with desks and chairs or traditional lecture halls. Classrooms cited as participants' favorite examples included updated lecture halls with curved tables, swivel chairs with castors, and staggered two tables to a step to facilitate both lecture and group work. Other favorite classroom examples included rooms with desks and chairs, conference style tables, and SCALE-UP or Active Learning tables. Least favorite classrooms tended to be traditional lecture hall classrooms with stadium-style seating. Others included rooms with desks and chairs. Across all classroom designs, participants suggested incorporating features including good line of sight to see the instructor and

instructional content, furniture (preferably tables and chairs), appropriate personal space and access to any seat in the room via wide aisles, natural lighting, and good acoustics supported by instructor microphones.

CHAPTER 6

CONCLUSION

Introduction

The purpose of the study was to explore the perspectives of undergraduate

students served by the UGA DRC on how the physical classroom space impacts learning

for students with disabilities. The results of the study discussed in Chapters 4 and 5 have

potential implications for classroom design and accessibility practices as well as future

research. While the opportunities for improvements and ongoing research are

innumerable, there are several key areas that warrant specific discussion based on the

study's results.

In this chapter, the summary of the findings is discussed as they relate to the

study's three research questions. Implications for practice are then explored through the

lens of specific practitioner groups, including architects and facilities planners, higher

education administrators, faculty, student services personnel, and instructional designers.

Suggestions for future research based on the study's results are also discussed focusing

on recommendations for repeated studies, further qualitative exploration, and intervention

studies.

Cumulative Findings of the Study

In Chapters 4 and 5, the results of the study were presented in parallel to the

survey structure and focus groups. Drawing on the results from the survey and focus

groups, the summary of findings is presented in the context of the research questions. The

research questions and summary of findings are as follows:

1. To what extent do students perceive the design of a classroom space impacts their learning experience?

   Participants' data suggest the perceived impact of the design of a classroom space on their learning experience is relevant to the needs of the individual.

2. What aspects of classroom design do students identify as impacting their learning experience?

   Survey and focus group participants ranked classroom design feature categories that impacted learning differently; however, the data suggest eight classroom features impact most students across all data collected in the open-ended questions of the survey and all questions in the focus groups. These features included (1) furniture, (2) technology, (3) personal space/overcrowding, (4) accessible seating location, (5) lines of sight, (6) acoustics, (7) aisles, and (8) lighting.

3. How do these student-identified aspects of classroom design impact their perceptions of their learning experience?

   Participants indicated features impacted their learning experience in various ways. Some examples were dependent on the needs of the individual, but the data suggest four themes related to the impact of the eight classroom design features participants identified. These include (1) accommodation practices that negatively impacted their independence and resulted in unwanted attention and feeling devalued. While not directly tied to learning, these experiences may impact student attitudes, motivation, and achievement; (2) access to student furniture and areas of the classroom that may impact students' ability to sit in preferred seats that supported learning and facilitated participation in class activities; (3) access

and use of assistive or instructional technologies and course materials that may

impact student strategies for studying and learning course content; and (4)

environmental factors, including acoustics and lighting, that may impact students'

ability to focus on the instructor, instructional content, and class activities.

The following subsections elaborate on summary findings for each research question.

Research Question 1: To What Extent Do Students Perceive the Design of a Classroom

Space Impacts Their Learning Experience?

To answer the first research question, survey participants were presented with six

classroom design feature categories (i.e., lines of sight, temperature, furniture, acoustics,

access, and lighting) and asked to rate their impact using a Likert scale. Next, focus group

participants were presented with the Likert scale results, ranked from the highest average

responses to least, and asked how relevant the features were to their learning.

In response to survey results ranking the impact of six classroom design feature

categories, focus group participants were then asked how relevant the features were to

their learning. The focus group participants disagreed with the ranked order that was

presented from the survey results. When identifying features that impacted their learning,

most focus group participants based their selections on their individual needs. For

example, one focus group participant with narcolepsy selected temperature as a feature

that had a high impact on her learning saying, "I'd rather have a cold classroom than a hot

classroom, but not everyone is like that. For me, that just helps me stay awake."

However, as the participant noted, this level of impact was not shared by other focus

group participants. This is illustrated in a comment from another participant in the first

focus group who said, "I would have expected access and furniture to be higher. I know

that, personally, those are some of the biggest issues I face on campus in rooms." Other participants also shared how various features impacted them personally.

Due to the diverging opinions between focus group participants and with the survey results, focus group participants were asked to think about the impact of the classroom design feature categories on the DRC undergraduate population as a whole. The consensus among focus group participants was that the perceived impact of classroom design features is relative to an individual's needs. As one focus group participant summarized, "People have issues with each of them [the classroom design feature categories]. I don't know that there are ones that stand out above the others. I think it's just relative to the student." Thus, in response to the first research question, the data suggests the extent of students' perceived impact of the design of a classroom space on their learning experience is related to the needs of the individual.

By law, universities are required to make accommodations for various disabilities based on the needs of the individual (*2010 ADA standards for accessible design*, 2010; Americans with Disabilities Act of 1990, 1990). Previous research provides support for the importance of meeting individual needs. For example, Fuller et al.'s (2004) research documents perceived barriers to learning, assessment, and access to information as encountered by disabled university students in the United Kingdom. More recently, Griful-Freixenet, Struyven, Verstichele, and Andries (2017) present similar findings (i.e., barriers to learning, assessment, and access to information) from data collected from disabled university students in Belgium. UGA is certainly meeting, and perhaps in some examples exceeding, the requirements of the ADA. This is admirable and participants acknowledged the university's progress in meeting accessibility requirements, as one

focus group participant noted, "I think as a general statement the newer buildings that UGA is making are leaps and bounds ahead of what it was."

That said, the findings by Fuller et al. (2004) suggests "what works for one student may not be a good option for another" (pp. 315-316). Additionally, Griful-Freixenet et al. (2017) indicate their data provides "substantial evidence that the traditional model of providing retrofitting accommodations depending on the disability type is inefficient" (p. 1645). Working to broaden the frame for meeting individual needs can lead to greater benefits to all students, not just those with disabilities.

Universal Design principles may provide just such guidance (Center for Universal Design, 1997; Meyer et al., 2016; Story et al., 1998). While there are limitations to the Universal Design principles in practice, the framework offers a more inclusive approach to designing classroom spaces and structuring learning environments, and it affords users the flexibility to adapt in response to changing needs. By adopting principles of Universal Design for Physical Spaces for either new construction or renovation, universities can extend accessibility to benefit more students than just those with registered disabilities (Center for Universal Design, 1997; Story et al., 1998). For example, ramps not only benefit students in wheelchairs, but they can also benefit students with temporary disabilities such as individuals using crutches or walking casts from an injury (Story et al., 1998). More accessible furniture reported by the study participants, such as tables and chairs, benefit all students by providing more inclusive space for varied needs (e.g., anxiety, wheelchairs). Adopting a more inclusive framework, like the Universal Design principles, will enable universities to meet a broader range of needs for all students, thus improving the overall learning environment.

Research Question 2: What Aspects of Classroom Design Do Students Identify As

Impacting Their Learning Experience?

As previously described regarding the first research question, survey participants were asked to rate the impact of six classroom design features using a Likert scale. Additionally, survey participants used checkboxes to select ideal classroom design features that supported their learning. The cumulative results of the survey's Likert scale questions and checkbox selections were presented to focus group participants. Likert scale results were ranked from the highest to least average responses. Additionally, the checkbox results to receive the most responses ($n > 30$, 59.14%) identified by survey participants as supporting their learning were presented. Participants were then asked to reflect on how the listed features impacted their learning, and identify which features were most important for their learning.

Although focus group participant data suggested how impactful a classroom design feature was to student learning was related to the individual, there were examples where focus group and survey participants' classroom design feature selections aligned. The cumulative code counts that emerged during analysis of the survey's open-ended questions and the focus group responses across all questions suggested several features beyond what was previously identified by the survey's checkbox results and subsequent focus group responses. Specifically, eight features received the most frequency counts ($n > 20$) and represented more than 80% of the total code frequency counts related to classroom design features (see Table 6.1). These identified classroom design features included: (1) furniture, (2) technology, (3) personal space/overcrowding, (4) accessible seating location, (5) lines of sight, (6) acoustics, (7) aisles, and (8) lighting.

Table 6.1

Top Classroom Design Features by Frequency Counts

Classroom Design Feature	Survey Frequency Count (*n*)	Focus Group 1 Frequency Count (*n*)	Focus Group 2 Frequency Count (*n*)	Total Frequency Count (*n*)
Furniture	36	28	19	78
Technology	16	13	15	44
Personal Space/Overcrowding	22	4	16	42
Accessible Seating Location	15	6	10	31
Lines of Sight	5	11	13	29
Acoustics	8	9	12	29
Aisles	10	6	8	29
Lighting	8	4	9	21

Many of the features listed in Table 6.1 are interrelated. For example, furniture was the primary classroom design feature identified in the data as impacting learning; however, the data also indicated an overlap between furniture and other features. The results of the cumulative data are therefore organized into three themes: (1) Furniture and Access, (2) Technology, and (3) Environmental Features. Within the "Furniture and Access" theme, many of the aforementioned features describing furniture, personal space and overcrowding, accessible seating location, line of sight, and aisle space are described. This is followed by the results related to technology used by instructors and students. The "Environmental Features" theme summarizes the physical features of a classroom environment, which includes both acoustics and lighting. Each theme is discussed in more detail in the following sub-sections.

Furniture and Access. Across the survey and focus group data, results centered on furniture comfort, size, and unwanted attention associated with DRC-supplied desks or prioritized accessible seating locations. Participant data indicated student furniture was

frequently uncomfortable or poorly sized, and it often results in student requesting accessible furniture accommodations from the DRC. For example, one participant explained, "…thank goodness the DRC is available to put in furniture for me that I can use since I did have an aneurysm in my leg. My leg goes numb in certain chairs, and I cannot focus on… what is happening…" Multiple participants indicated the DRC furniture often led to unwanted attention, and in some cases, impacted their level of independence. As survey participant explained, "Current furniture accommodations for classrooms at UGA are all mobile, and while they have written notes on them stating 'Do not move,' my accessible furniture is nearly always moved somewhere around the room." She continued, "I have to ask classmates or my professors to help me move my desk where it should be, and I am dependent on their willingness to help."

The data also suggested participants preferred more personal space than was available to them in current classrooms, and they noted examples of overcrowded exits and lack of seating for all students. Preferred seating locations tended to be unique to the individual and their respective needs. In one such example, a self-disclosed combat veteran noted in the survey, "My back needs to be to a wall, and I don't want anyone walking behind me."

The study's results indicate participants tended to describe preferred seating locations relative to the instructor or students. For example, one focus group participant explained, "I need to be able to watch the professor because otherwise I know if I'm not looking at him or her, I'm gonna be looking at my computer, or looking at whatever's around me. I don't wanna have to go like *this* [twists in chair] for the whole class period." Another survey participant explained, "The most important feature to me is having the ability to sit in the front row to avoid distractions from other students." Seating locations

were determined by the ability to see the instructor, for the instructor to see the student, and for students to remain focused on class activities, avoid distractions, and/or maintain a connection with classmates. According to participants, access to preferred seating locations was impeded by features including narrow aisle space and stairs.

The findings of this study, identifying furniture and access as impacting student learning experiences, is a central theme in the literature (Burgstahler, 2009; Milic Babic & Dowling, 2015; Moriña & Morgado, 2018; Story et al., 1998). Previous studies identified similar barriers and student perceptions of the impact on their learning. For example, Moriña and Morgado (2018) identify inadequate furniture as hindering students' ability to complete classwork and stairs or platforms as barriers to access areas of the classroom, such as the whiteboard. Similarly, data from Milic Babic and Dowling (2015) identify limited access as barriers for preferred seating locations. Moving toward classroom design practices that more fully embrace Universal Design of Physical Spaces principles, such as incorporating tables and chairs in classrooms and replacing stairs with ramps, may further transition UGA from a reactive, accommodation-based approach toward a proactive and inclusive approach to the classroom environment (Burgstahler, 2009; Milic Babic & Dowling, 2015; Mole, 2012; Moriña & Morgado, 2018; Story et al., 1998).

Technology. Access and use of technology by students and instructors were also highlighted by participants. Classroom design features, such as furniture that was too small to accommodate laptops and limited or no access to power outlets, were specific pain points noted in both the survey and focus groups. As one survey participant explained, "I need outlets to charge my devices and classrooms in places like the MLC [Miller Learning Center] don't have any or they have about four in the back of the room

where there are no seats." Another focus group suggested bigger desks in lecture halls saying, "Sometimes I want to have my notebook and my computer out at the same time so that I could take notes, look at the lecture slides."

Instructional technology practices were also discussed. Instructor-specific technology policies in direct conflict with student accommodations were one specific concern. For example, a focus group participant noted, "A lot of my professors have [a] no laptops rule, and it's under my accommodations to use my laptop for note-taking." Other examples included seating requirements for technology users in conflict with seating accommodation requirements and use of clickers in classes with enforced time limits for students with extended time accommodations.

Instructors avoiding technology or improperly using technology was a second concern. As one focus participant described, "I know so many teachers that they get there and they're like, 'I don't know how to use this!' And you're like, 'Help? You've been teaching for a few years.'" Instructors not using a microphone and turning away from students while speaking posed some problems. A survey participant explained challenges with whiteboard usage saying, "Whiteboards in classroom makes professors turn away from audience which makes it harder to hear." Instead, the participant suggested, "If professors had a laptop in which they could use as a whiteboard which could be projected, that would be helpful. This way, they are still facing the students while writing on the 'board' which is their laptop." Additionally, instructors improperly using microphones such that they "pop" or "squeal" were noted as challenges.

A third concern was instructors and note-takers not making course materials or notes available to students. As one survey participant explained, "Some professors wait until after the lecture is over to upload the slides covered in class to ELC [learning

management system], and some professors decide not to upload their slides at all."
Instead, the participant suggested:

> It would help me to always be able to access slides DURING [participant's
> emphasis] the lecture so that I can keep going at my own pace and not fall so far
> behind when the professor moves on while I'm in the middle of taking notes.

Other participants suggested the quality of notes varied depending on the note taker. As one focus group participant explained, "Some notes from note takers can be more confusing than anything. It's just like a jumble of information." Another focus group participant explained, "It takes a week or two weeks to get it, and then I'm two days before the test and like, 'Hey, can you upload these notes?' She has them, but it just takes so much more time." The data suggests obtaining course materials, such as PowerPoint slides and class notes, in a timely fashion was important for supporting learning.

Additional studies identified during the literature review also highlight technology and instructional practices as impacting learning experiences for students with disabilities. For example, Morgado Camacho et al. (2017) suggest teaching methodologies that use new technology resources is key for supporting inclusive classroom learning environments. Instructional practices were also central in Fuller et al. (2004) and Milic Babic and Dowling (2015). For example, Fuller et al. (2004) documented a lack of support from instructors for students with disabilities, including prohibiting the use of audio recorders in class and failing to provide user-friendly handouts.

Drawing on the principles of Universal Design for Physical Spaces may improve classroom designs and features in aiding the access and use of technology (Story et al., 1998). Further, implementing Universal Design for Learning principles as part of a

faculty development model may encourage instructor practices to be more inclusive in their approach to technology use in the learning environment (Meyer et al., 2016). For example, instructors that make small changes, such as leveraging technology-based tools for content delivery (e.g., learning management systems), organizing and presenting content in accessible formats (e.g., chunking content by topic, using document styles to denote section headings), and providing instructional scaffolds (e.g., combining lecture and group work, supporting readings with videos), align with the principles promoted by Universal Design for Learning (Disabilities Opportunities Internetworking and Technology, 2019; Meyer, et al., 2016).

Environmental Features. Classroom design features related to acoustics and lighting were also discussed. Both survey and focus group participants tended to discuss acoustics as it related to distracting noises (e.g., student-generated, ambient, etc.) and the ability to hear an instructor. As one survey participant explained, "Classrooms and labs sometimes have too high background noise [that] students on hearing aids or with sensory processing problems cannot cope with." Additionally, instructor use of microphones was noted by focus group participants.

With respect to lighting in classrooms, one focus group participant with a hearing impairment noted that lighting played an important role in his ability to read lips saying, "…for someone who… has a hearing disability… I depend solely on lip reading. So, lines of sight is important. Lighting is also important…" Most survey and focus group data centered on preferences for natural lighting in classrooms and challenges experienced when lighting is either too bright or too dark.

The results from this study suggest environmental features of a classroom impact student learning. A review of previous research by Weinstein (1979) suggests variation

between research results connecting the physical classroom environment and the student learning experience. For example, Weinstein (1979) concludes there was "little impact on achievement" (p. 598) across the results, including classroom design features like acoustics and lighting. However, Weinstein (1979) also suggests there is "considerable evidence" (p. 598) related to the impact of classroom design features on behaviors and attitudes. More recently, the findings of Moriña and Morgado (2018) and Yang, Becerik-Gerber, and Mino (2013) align with results of this study, suggesting both acoustics and lighting have implications on students' learning experiences.

Despite contradictions reported in the literature, the principles of Universal Design for Physical Spaces leave room for adaptation and ongoing modifications based on end-user feedback (Burgstahler, 2009; Story et al., 1998). The purpose of Universal Design for Physical Spaces is to create a more inclusive environment. Incorporating feedback specific to the institution or more granularly may yield improvements for learners and classroom users (Burgstahler, 2009).

Research Question 3: How Do These Student-Identified Aspects of Classroom Design Impact Their Perceptions of Their Learning Experience?

Participant data suggested three themes that describe how the eight classroom design features impacted perceptions of their learning experience. These overarching themes included: (1) Impeded Access and Participation, (2) Barriers for Learning, and (3) Distractions and Sensory Impacts. These themes will be discussed in the following sub-sections.

Impeded Access and Participation. The data suggest access had a more direct impact on student learning experiences, impacting students with physical or invisible disabilities. The data suggest access-related classroom design features limited students'

ability to sit in preferred seating locations to see and hear the instructor, access their assistive or instructional technologies, or participate in instructional activities like group work.

Narrow aisles and stairs impeded access to specific areas of the classroom for some participants, particularly those with physical disabilities. As one survey participant explained, "Small desks, slim aisles make it hard to navigate and claim territory." It also influenced seat choices (e.g., on aisles, back of room) for users with invisible disabilities like anxiety.

Steep stairs in classrooms also dictated seating location, depending on whether it was more important to see the instructional content or the instructor. As one focus group participant explained, "It's like a straight down, 45-degree angle [on the stairs]." She continued, "So, if you need to sit close to the professor, you can't really see the thing [projected content] because you're straining your neck because it's so down low. And then, if you're up high it's really far away."

The literature also points to impeded access and participation as examples of how student learning is impacted (Fuller et al., 2004; Milic Babic & Dowling, 2015; Moriña & Morgado, 2018). In one study, Moriña and Morgado (2018) provide an example where a teaching platform at the front of a classroom prohibited students from reaching the front of the room or writing on the board. Examples like this one are shared throughout the literature and highlight access-related issues as drivers for more inclusive classroom environments (Fuller et al., 2004; Milic Babic & Dowling, 2015; Moriña & Morgado, 2018; Story et al., 1998).

The results of this study suggest student learning experiences may be impacted by impeded access to classrooms and participation in classroom activities. These access-

related issues may have implications for classroom designs, instructional design and the associated learning activities, and student learning (Meyer et al., 2016; Story et al., 1998). Adopting classroom access practices that align with Universal Design for Physical Spaces may have added benefits by enabling students to select preferred seats that support their learning needs and inclusion in classroom activities (Fuller et al., 2004; Mole, 2012; Story et al., 1998). Additionally, selecting classroom spaces that best support teaching and learning activities for the diverse needs of learners aligns with the principles of Universal Design for (Meyer et al., 2016).

Barriers for Learning. Technology-related issues described in the data also appeared to have directly impacted student learning experiences. Many of the technologies participants used (e.g., laptops for note taking, digital audio recorders, C-Print machines for captioning, etc.) were approved accommodations to support their learning. However, both survey and focus group participants provided examples where classroom policies or instructional practices hindered or prohibited technology use. Other examples included designated seats for technology users that conflicted with seating accommodations and the use of student response systems ("clickers") to answer pop-quiz questions in class without adhering to accommodations for extra time on exams.

Survey and focus group participants also noted access to course materials including PowerPoint slides for note taking impacted strategies students used to support their learning. As one survey participant noted, "Some professors wait until after the lecture is over to upload the slides covered in class to ELC, and some professors decide not to upload their slides at all." Obtaining notes from notetakers in a timely fashion was another practice that the data indicates impacted student learning.

The data suggest these policies and instructional practices created barriers for student learning. The examples indicated policies and practices negatively impacted scaffolding strategies students used for learning and directly challenges accommodations afforded to students. As a result, these barriers to accessing or using assistive or instructional technologies and course materials may have implications for achievement based on findings in the literature (Griful-Freixenet et al., 2017; Meyer et al., 2016; Moriña & Morgado, 2018). Embracing the principles for Universal Design for Learning, like posting content online via the university's learning management system, may foster a more inclusive approach to technology use that supports the needs of learners (Griful-Freixenet et al., 2017; Kozma, 1994; Meyer et al., 2016).

Distractions and Sensory Impacts. Finally, data from this study suggested some environmental impacts of a classroom's design on student learning experiences. Acoustics and lighting were two features participants identified specifically. The ability to hear the instructor and the use of the microphone was a factor for survey and focus group participants across multiple disabilities. Participants discussed acoustics that limited their ability to hear an instructor, even with the use of the microphone, in sections of a classroom. As one survey participant summarized, "Often extremely hard to hear professors in large classrooms, especially lecture halls when noise of students around me is taken into consideration. Ability to focus and take in information all the way around is greatly affected by these factors." Distracting environmental noises, such as echoes, students talking or whispering, rustling papers, buzzing lights, or dripping faucets, impacted some participants' ability to focus on the instructor or class activities. This was particularly true for participants who self-identified as having hearing impairments, auditory processing disorders, or ADHD. Others discussed the importance of instructors

wearing microphones so they could be heard later on digital audio recordings or when their back was turned to write on the whiteboard.

Lighting in the classroom was also an important classroom design feature for students across multiple disabilities. Several participants discussed their preference for natural lighting. In one example, a survey participant explained, "Large open windows that let in natural light really help me wake up and focus." Rooms without windows were not preferred but may not have a direct impact on learning. As one focus group participant explained, "…it doesn't directly affect me in a way that's related to my disability, but I think it affects the overall atmosphere of the class. It makes it less pleasant." In contrast, participant data indicated overly bright or dim lighting may more directly impact learning for some individuals. As a third focus group participant noted, "With my epilepsy, I'm very sensitive to light especially very, very bright, and so I think that would be the one thing that – not triggers it necessarily – but it does bother me in a sense." Similarly, participants noted that dim lighting or dark rooms impacted their ability to stay awake or focused.

The data suggest that environmental factors such as acoustics and lighting impacted students' ability to remain focused on the instructor, instructional content, and class activities. Similar results about environmental impacts on student learning have been discussed in the literature (Dockrell & Shield, 2006; Weinstein, 1979; Yang et al., 2013). For example, a study by Yang et al. (2013) found poor acoustics caused distractions for students and perceptions of lighting were determined by brightness, distribution light, and color. Natural lighting was preferred in most examples, barring issues with glare.

According to Harmon and Kennon (2014), "Accessibility codes and standards do not dictate sound transmission. They are mostly concerned that verbal communication is clear to the occupants" (p. 233). Similarly, the accessibility codes are concerned with visibility and contrast, not lighting standards. That said, the *2010 ADA Standards for Accessible Design* reference existing building codes for acoustical and lighting design and performance criteria in schools (*2010 ADA standards for accessible design*, 2010; Harmon & Kennon, 2014). Adhering to codes that establish the range for acceptable background noise in a space and lighting standards (e.g., ANSI, NEC, etc.), or perhaps exceeding those minimums in some spaces, may further support students learning.

Summary

In summary, the data suggest there are eight features that participants identified as primarily impacting their learning experiences, but the impact may be relative to the individual. A review of the data suggests four themes emerged related to how the eight student-identified features impacted perceptions of their learning. The first theme suggested accommodation practices intended to facilitate student furniture and access that negatively impacted their independence and resulted in unwanted attention and feeling devalued. While not directly tied to learning, these experiences may impact student attitudes, motivation, and achievement. The second theme suggested access directly impacted students' ability to sit in preferred seats that support learning and facilitate participation in class activities. Similarly, a third theme suggested policies and practices hindering or prohibiting access and use of assistive or instructional technologies and course materials may create barriers for strategies students leverage to support their learning. Finally, the fourth theme suggested environmental features, including acoustics

and lighting, may impact students' ability to focus on the instructor, instructional content, and class activities.

The results suggested areas where UGA is making positive strides with accessibility practices, particularly with newly constructed classroom facilities, but the data also identified opportunities for ongoing improvements. For example, the data identified current accommodation practices as negatively impacting student learning experiences. Participants expressed a desire to maintain their privacy and independence, which could not be achieved when provided an accessible desk. Drawing on the literature, Universal Design for Physical Spaces and Universal Design for Learning outline specific principles that, if put into practice, may directly address current areas of impact — both physical and psychological — by designing classrooms and structuring learning environments that promote access to a broader, more diverse user population (Meyer et al., 2016; Story et al., 1998; Wagner et al., 2007).

These opportunities were echoed across the remaining three themes. Challenges created by policies and instructional practices, technology access and use, and environmental features (e.g., acoustics, lighting, etc.) also suggest opportunities via Universal Design for Physical Spaces and Universal Design for learning. For example, the data identified "no technology" policies contradicted approved student accommodations; however, reviewing instructional practices through the lens of Universal Design for Learning may provide opportunities to create a more technology-inclusive classroom space that generates multiples means for engagement, representation, and action and expression (Boothe et al., 2018; Meyer et al., 2016; Story et al., 1998). Similarly, physical designs of classrooms may be further reviewed based on existing codes, guidelines, and requirements, but Universal Design for Physical Spaces may

provide opportunities to extend those minimum standards to better meet the diverse needs of learners (Story et al., 1998).

The results of the study also emphasized the importance of the underlying structures related to affordances. The Theory of Affordances, the principles from Universal Design for Physical Spaces, the principles from Universal Design for Learning, and Norman's Fundamental Principles of Interaction each play an important role considering the implications for practice and future research (Gibson, 2015; Meyer et al., 2016; Norman, 2013). These include considerations not only for the physical affordances of a given classroom space, but also the affordances that support learning (Gibson, 2015; Greeno, 1994; Meyer et al., 2016; Norman, 2013).

How these features impacted student perceptions of their learning experience have implications for practice and research. Based on the data collected in this study, a number of suggestions may be relevant to key stakeholder groups in higher education. Additionally, further research may provide more insights into the experiences of students with disabilities. In the subsequent sections, suggestions grounded in the data from this study and literature are discussed.

<div align="center">Implications for Practice</div>

The results of this study provided foundational data that may be of value for various practitioner groups. Based on participant data, a number of suggestions for architects and facilities planners, administrators, faculty, student services personnel, and instructional designers were generated (see Figure 6.1). Additionally, the implications for practice may result in further research opportunities, which are explored later in this chapter.
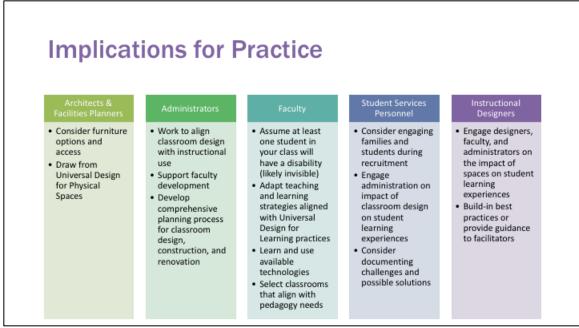
Figure 6.1. Summary of implications for practice.

Architects and Facilities Planners

Architects and facilities planners play a significant role in the design and construction of classrooms in higher education institutions (Abramson, 2015; Argon, 2009; Baker & National Clearinghouse for Educational Facilities, 2012; Society for College and University Planning, 2015). Although classroom designs are not implemented solely at the discretion of the architects and facilities planners, these groups typically serve in an advisory capacity to a number of key stakeholder groups at each institution and as a liaison to the companies and personnel constructing the facilities. Architects and facilities planners also play an important role in synthesizing the building design requirements with the preferences for aesthetics and function. For this reason, the results of this study are especially informative for these groups and may serve as a catalyst for implementing changes and seeking opportunities to collect additional data.

An interesting challenge that emerged from the data was that may be of interest to architects and facilities planners relates to the impact of a classroom's design relative to

the needs of the individual. As one participant shared, "I think it's probably relative… Is it more of a mobility thing? Is it a learning disability? …I don't know that there are ones that stand out above the others. I think it's just relative to the student." While this could be an aspirational goal, it is impossible to design a classroom that meets the needs of every individual who enters a space. There will always be individuals whose needs fall into the statistical margins, even when targeting the needs of underrepresented groups such as students with disabilities. What improves the needs of one individual may also negatively impact the needs of another individual. That said, participants identified a number of classroom design features that support their learning, and along with that may come opportunities to identify design improvements that benefit all users.

Furniture, particularly in lecture halls, was central to discussions about classroom design features that benefit all users in the open-ended feedback and focus groups. Participant data suggested that curved tables and separate chairs that were soft, swiveled, and on casters best supported their needs. For students with invisible disabilities, tables and chairs specifically supported individual comfort and personal space, allowing students to shift their seat to avoid distractions, swivel slightly in place to maintain focus, and establish space for books, notes, and technology. For students with physical disabilities, these features provided flexibility for accessible seating locations (particularly when accessible via ramps and wide aisles) and facilitated collaboration with peers for group work activities.

From this example, there are opportunities for architects and facilities planners to draw from the concepts of Universal Design for Physical Spaces (Center for Universal Design, 1997; Meyer et al., 2016; Story et al., 1998), selecting furniture and classroom design features that facilitate access and use for all users is needed. Additionally,

concepts from Universal Design for Learning may influence design choices and how features are applied to support users with invisible disabilities (Meyer et al., 2016). For example, in response to participant concerns about acoustics, access for assistive technologies, and support instructional technologies, architects and facilities planners may seek to ensure acoustical treatments to support individuals with auditory processing disorders, adding power outlets to support assistive technologies, and seeking user-friendly technological advancements that support faculty and students' teaching and learning needs.

Administrators

Administrators are central to the development and application of policies, procedures, and funding for classroom design and use in higher education institutions (Society for College and University Planning, 2015). Some administrators participate as stakeholders during the classroom design, renovation, or construction process. Additionally, these stakeholders often serve as a conduit between classroom users, typically made up of faculty and students, and the architects and facilities planners in conveying the purpose and needs of a given classroom space. The results of the study may, therefore, be significant for administrators involved in decision-making related to classroom design and use.

One takeaway from the results of this study suggested there may be opportunities for administrators to take a more active role in ensuring classroom design align with the instructional use. Participants in this study differentiated between "lecture" and "group work" as two types of instructional use. The data indicated that some classroom design features are better than others at supporting these instructional practices. For example, the data suggests that traditional lecture halls with stadium-style seating and writing tablets

did not adequately support lecture activities. As one survey participant noted, "A lot of the desks are too small in the lecture rooms." Another survey participant provided a list of needs saying, "Having space for a test booklet, answer sheet, textbook or laptop, calculator, and tiny bit of space between students." Given the number of instructional items students need during class, administrators may wish to review the available workspace available to students during lectures.

The data also suggested that traditional lecture halls did not adequately support group work activities. One focus group participant explained traditional lecture halls posed access problems for group members trying to gather during class: "I think it's important for the design in general to be cognitive [*sic*] of group work… One of the classrooms is set up like the lecture hall… It's all in row, and you can't move the chairs." She continued, "And I have no idea if somebody had a wheelchair how they would even fit in between because I can barely fit… You can't fit in between when the desks are out." Instead, the data indicated that lecture halls with wide aisles, curved tables, and chairs on casters that swivel provided opportunities for both lecture and group work activities. As one participant explained, "It's a combination of a lecture hall and tables and chairs in the sense that it's kind of stadium-style so that everybody can see, but the aisles are huge." Another participant added, "…If you curve it, it's more inclusive and people can adjust [their position to see or hear]." Updating lecture halls to facilitate access and support both lecture and group work activities may create a more inclusive classroom environment for learners.

Administrators supporting faculty development is a second implication for practice based on the data from this study. For example, the data indicated there were opportunities to improve faculty education and training on the appropriate use of

classrooms and instructional technologies to better support learning (e.g., instructor microphone usage, "no technology" policies, presentation and note-taking practices, etc.). Structuring faculty development programming that highlights available resources and best practices for faculty use of classroom spaces is needed. A more in-depth approach might be to explore faculty development programming centered on instructional design best practices that establish standards for classroom and technology use. The University of Washington's Disabilities, Opportunities, Internetworking, and Technology (DO-IT) Center offers this type of training for faculty and others, and they publish a number of self-service resources focused on Universal Design concepts in practice (Disabilities Opportunities Internetworking and Technology, 2019). Throughout the faculty development process, it is also important to collect feedback from faculty in order to make iterative changes to the programming and identify classroom spaces out of alignment with instructional needs. Soliciting feedback from faculty at multiple points in the faculty development cycle (e.g., during program/course development, during program/course delivery, and following program/course delivery) further supports the iterative process for programming revision.

Finally, administrators developing a comprehensive planning process for classroom design, construction, and renovation was a third area identified by participants. Data from this study suggests that newly constructed classroom spaces improve alignment with accessibility standards and pedagogies. As one participant explained, "I think as a general statement the newer buildings that UGA is making are leaps and bounds ahead of what it was." In contrast, the data suggest funding and design consideration is needed for older, existing classrooms. The same participant suggested, "I think we also need to remember that we need to go back and update these older buildings

instead of just making newer buildings." For administrators, this means working with stakeholders, such as classroom users and facilities planners, to develop comprehensive planning and prioritized funding for renovations to update classrooms to meet current instructional needs. This is a strategy supported by The Society for College and University Planning (SCUP), who published a 2015 report outlining factors that support overall success in planning (Society for College and University Planning, 2015).

Faculty

Faculty often have the most direct contact with students of any other stakeholder group, particularly in classroom settings. How faculty design instruction and use a classroom space can have a direct impact on the student learning experience (Meyer et al., 2016). Faculty have first-hand experience with the affordances and constraints of a given space along with their students, and they are empowered to adjust their practices as a result.

Based on the data in this study, approximately one in 20 students will have a *declared* disability according to the director of the UGA Disability Resource Center and the available undergraduate population data (E. W. Benson, personal correspondence, September 4, 2018; The University of Georgia, 2018b). The word "declared" is emphasized because this statistic only represents the number of students who request support services and accept accommodations as part of their student learning experience. There are other students who have diagnosed disabilities that may not request support services. Additionally, the majority of students with declared disabilities have invisible disabilities such as ADHD, anxiety, learning disabilities, and depression (E. W. Benson, personal correspondence, September 4, 2018), which may require different types of accommodations than those for students with physical disabilities (Meyer et al., 2016;

Story et al., 1998). Given these statistics, an important consideration for faculty to embrace is the assumption that every class they teach will have at least one student with a disability, and chances are that disability will be invisible.

Operating within this assumption, faculty can begin to rethink their teaching and learning strategies and adapt accordingly. Incorporating concepts from Universal Design for Learning into instructional design practices may provide strategies for adapting course curricula and lesson plans to be more flexible for student needs without compromising academic rigor (Meyer et al., 2016). Providing students with multiple ways to demonstrate knowledge (e.g., written paper, video, demonstration, etc.) is an example of this in practice (Burgstahler, 2019; Meyer et al., 2016). Additionally, developing materials that meet Universal Design for Learning standards may also reduce the likelihood of having to modify materials to meet accessibility requirements (Meyer et al., 2016; Story et al., 1998). For example, using the built-in "styles" feature in Microsoft Word to format headings, paragraph text, lists, and tables generate documents that are organized, easy-to-read, and accessible without much additional effort (Sinclair, Morrison, & Rempel, 2015). Strengthening a faculty member's understanding of Universal Design for Learning concepts may also help the faculty member to adapt lessons or activities on-the-fly when faced with unexpected challenges.

A second area for consideration for faculty is the use of available technologies in the room. Many classrooms are outfitted with tools designed to facilitate instruction and support students with disabilities. One example that participants identified in this study is the use of instructor microphones. As one participant noted, "I really like when instructors have microphones because it helps like my brain to pick their voice out of any other noises that are going on and just focus on that." Similarly, another participant

explained, "I'm slightly hard of hearing in one ear, so if I can't hear what the professor's saying or they're turned towards the board and they're saying something… I don't have anybody around me to ask [for help]."

Using a microphone helps all students hear the instructor, but it is particularly effective for students who have a hearing impairment or use a recording device to assist with note-taking. As a third participant explained, "…if the professor is walking around, and they don't have the mic on, then my [digital audio] recorder won't… pick them up." The data suggests using an instructor microphone helps to ensure more consistent acoustics for students, even when the instructor's back is turned to the class.

Another example of faculty use of available classroom technologies is using the document camera or leveraging built-in annotation software on computers in place of whiteboards for writing notes. The data suggests some students had difficulty viewing class notes. As one participant explained, "I hate that when there's [*sic*] two separate screens." She continued, "Because, if you're sitting on one side and your professor's all the way over here and that's the one [whiteboard] that they choose to write on, you have no idea what they're writing." A survey participant also noted that "Contrast of power points [*sic*] and dry erase markers" supported her learning.

Using document cameras and annotation software helps to ensure the size of the notes are visible to students on a projection screen, particularly in large classrooms where handwriting on whiteboards may not be visible in the back of the room. Visibility is further facilitated when high contrast colors are used. Using the document camera to view physical objects, like handwritten notes on paper, or annotation software on projected content, like PowerPoint slides or webpages, enables the faculty member to remain facing the class in a more stationary position, which aids some students with lip reading and

tracking instructor movements. The use of these technologies also enables faculty members to save images of these notes and annotations, which can then be uploaded to a learning management system for student review following class.

Finally, a third practice for faculty to consider is selecting classroom spaces that align with their intended instructional use whenever possible. In some institutions, this may not be possible, but typically faculty have some options for identifying classroom preferences when assigning classroom spaces (e.g., Office of the Senior Vice President for Academic Affairs and Provost, 2019). The study's data suggests this alignment is particularly effective for classes with group work expectations. For example, one participant described her experience in a SCALE-UP classroom saying, "Group work is much easier for me in this kind of setting – definitely it is designed for that – because the people who I'm listening to and talking to or right next to me instead of separated by all these other people."

Participants indicated traditional lecture halls with stadium-style seating and steps limits opportunities for collaboration, but lecture halls with tables and chairs, wide aisles, and ramps may better suit both lecture and group work activities. Additionally, the data indicated that SCALE-UP and active learning classrooms supported group work, but some participants noted there were limitations for lecture-based activities for some students with invisible disabilities in these classrooms (e.g., acoustics, visibility of projected content in relation to the instructor, etc.). As one participant explained, "I liked the group work aspect because I do work really well in groups." She continued, "There's no good spot in the room for me to have a good… view of the professor while also having a good view of a screen." By playing a more active role in selecting classroom

spaces, faculty also have the opportunity to communicate with administrators where gaps in the process or availability of suitable classroom spaces exist.

Student Services Personnel

Personnel working in student services interact with students at key points of during their college experience including recruiting or orienting new students, assisting existing students, or preparing students for graduation. Student services personnel also play an important role as ambassadors to both faculty and the administration, helping these groups to understand the needs of students and share ideas for supporting them. The dual-facing role of student services personnel leads to several implications for practice.

The data from this study suggests there may be opportunities to engage with families and students with disabilities prior to attending college. As one participant described, she had different expectations for classrooms based on the amount of tuition. She explained, "I remember when I transferred here and I walked into some of the buildings on North Campus and looked at the desk, I just thought it was a joke…" She continued, "I've transferred here, and I'm paying triple the amount of money that I've paid before to come to school. And it's like my learning experiences – it doesn't matter." Developing recruitment materials that showcase resources available to students with disabilities and speaking honestly about limitations can help set expectations about the facilities and support levels. These recruitment materials may also lead to productive conversations about expectations for students as they learn to transition into a more independent role that requires self-advocacy.

A student's transition to adulthood also opens opportunities for developing and promoting support programs targeting students with disabilities. In addition to topical programming focused on directing students to appropriate support services and resources

(i.e., where to go for help), there may be opportunities to promote strategies for increased independence (e.g., time management, travel to classes, financial management, effective engagement with faculty and teaching assistants, etc.). One example might be a peer mentoring program that helps share lessons learned for increased independence and promotes resiliency in the face of adversity. Face-to-face workshops or online webinars (both synchronous or asynchronous) may also provide opportunities to introduce resources and topics of interest to students. Finally, leveraging web-based content management systems (e.g., knowledge base, course in a learning management system, etc.) and/or social media platforms (e.g., Facebook groups, message boards, etc.) may provide opportunities to connect students with self-service resources and develop communities for support.

The results of the study also generated suggestions supporting more interactions between student services personnel and the administration to explain the impact of classroom design on students and their learning. In one example, a participant noted how a newly constructed facility required immediate renovation because the bathrooms did not meet accessibility codes. The participant suggested a way of framing the issue with the administration as follows, "…short term, you might be maybe shelling out a little more money in the front end to get everything accessibility-friendly and make sure that students have the best technology at their disposal." She continued, "But in the end, it means you're not having to go back in and redesign classrooms or bathrooms or whatever else."

With this example in mind, one suggestion is to maintain data documenting classroom design challenges and possible solutions for overcoming them (Burgstahler, 2009; Mole, 2012). This is supported by Burgstahler (2009), who suggested periodic

evaluations of policy and practice applications is an integral part of the Universal Design process. By documenting this data over a period of time (e.g., five years), it may be possible to evaluate pain points and develop recommendations guiding facilities planners and administrators toward design improvements. It may also identify underlying issues related institutional infrastructure and instructional use, which may be addressed through adjustments to administrative policy and faculty programming. Serving as a central resource for collecting and maintaining this data strengthens decision-making, and student services personnel are in a position to facilitate this process and draw support from a diverse group of users (Burgstahler, 2009).

Instructional Designers

A final group for whom the results of this study have practice implications are instructional designers. Within the field of instructional design, there has been a great deal of research on the design and delivery of instruction in both traditional face-to-face and online settings; however, the focus often centers on the quality of the course content and less on the medium by which content is presented (Clark, 1983, 1994; Jonassen, 2004; Kozma, 1991, 1994; Reiser, 2001a, 2001b; Spector, 2008). An inherent assumption may be that any facility or online platform will conform to the instructional activities hosted therein (Clark, 1983, 1994). That said, consideration for the classroom environment as a potential contributing influence on learning should be considered (Kozma, 1994).

The results of this study highlight opportunities for instructional designers to engage fellow designers, faculty, and administrators in discussion around the impact of instructional spaces on student learning experiences. Some instructional designs may warrant specific guidance related to facilities. Additionally, instructional designers may

seek to build in best practices and/or provide guidance to facilitators and instructors that draw on concepts of Universal Design for Learning and, in some cases, Universal Design for Physical Spaces (Design for Human Diversity, n.d.; Meyer et al., 2016; Story et al., 1998). Increasing attention to the diverse needs of learners will further help inform other instructional designers and those who facilitate the instructional activities.

<div align="center">Implications for Future Research</div>

As with any study, there are endless opportunities for continued research. The outcomes of this study have inspired three key areas of potential exploration: (1) potential structures for repeated studies, (2) further qualitative exploration, and (3) intervention studies. This discussion draws on both the results of the study and the literature used to support the study's design (see Figure 6.2).
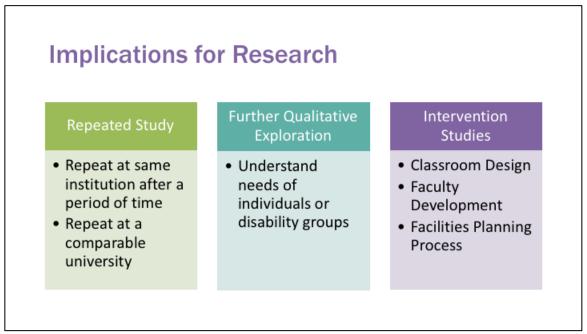
Figure 6.2. Summary of implications for future research.

Repeated Study

The study's survey included a statistically acceptable response rate ($N = 89$, 6.51%), and focus group participants ($N = 12$) represented a diverse cross-section that

was roughly proportional to both the UGA DRC's undergraduate population and the survey's population. Even so, the study was limited to the responses of the individuals who participated in the study, and the data indicate that the impact of classroom design features was dependent on the needs of the individual. Although as Patton (2015) notes, "By their nature, qualitative findings are highly context and case dependent" (p. 658), cross-case comparisons and multi-layered case studies are options for analyzing patterns and identifying themes (Patton, 2015). Repeating the research as designed might help strengthen or challenge this study's findings.

One option might be to repeat the study at the same institution after a period of time (e.g., after five years). This might reveal areas of improvement, or it may identify areas of ongoing needs. Additionally, finding ways to strengthen participation rates in both the survey and focus groups might strengthen the validity, reliability, and transferability of the results.

Another option might be to repeat the study at a comparable university. Conducting the study at another large university in the United States may produce interesting standalone findings, or it may yield comparisons to this study's reported findings. This aligns with Patton's (2015) suggested method for case study layering as he stated, "…you can always combine studies of individuals into studies of a program—but if you only have program-level data, you can't disaggregate it to construct individual cases" (p. 536). Considerations should be given to the institutional infrastructure differences, such as support services for students with disabilities and procedures for addressing accommodation needs.

Further Qualitative Exploration

A second area of research might come from further exploration of this study through additional in-depth qualitative interviews or focus groups. As Seidman (2013) explained, "At the root of in-depth interviewing is an interest in understanding the lived experience of other people and the meaning they make of that experience" (p. 9). Because the results of the study indicated that the impact of classroom design is dependent on the needs of the individual, it might be helpful to interview participants representing specific disabilities, disability groups, or the DRC staff who coordinate their accommodations. This may reveal more specific information about the needs of specific disabilities or disability groups, revealing additional implications for practice or further research related to the principles of Universal Design for Physical Spaces (Story et al., 1998).

Additionally, many of the examples participants described reflected a desire to ensure individuals received accommodations without negatively impacting their independence or causing unwanted attention. Furniture was a focal point for this discussion, but the overlap with other access-related classroom design features (e.g., personal space and overcrowding, accessible seating location, lines of sight, etc.) reflected broader issues related to classroom accessibility. For example, the size and comfort of the furniture impacted some participants' ability to sit through class. As one focus group participant explained, "I get really sore. I hurt from sitting for long periods of time. The longer I sit, usually, unless I get back up, the more I'm going to hurt." As a result, students were issued desks and chairs from the DRC as an accommodation; however, multiple participants shared personal experiences of unwanted attention and negative impact to their level of independence when provided a desk from the DRC.

Examples included labels on desks exposing the privacy of individuals receiving services from the DRC as well as having desks moved, claimed, or vandalized by other students.

Although these examples do not tie directly to an impact on student learning, they do describe the personal experiences of attending class with a disability, and this may have implications for student attitudes, motivation, and achievement (Wagner et al., 2007). As Wagner et al. (2007) reports, research suggests the subjective experiences of adolescents and young adults influence choices. This applies to class-related activities, such as completing homework or studying, which in turn influence student achievement. Conducting additional qualitative studies with students who have a declared disability about potential connections between learning environments and student attitudes, motivation, and achievement may contribute to the broader literature on the impact of accommodation practices, Universal Design for Physical Spaces, and Universal Design for Learning.

Intervention Studies

A third opportunity for continuing research is the use of intervention studies targeting specific research topics. These include research on interventions for classrooms design, faculty development, and the facilities planning process. Drawing from Kozma's (1994) suggestion to review the "underlying structures and functions" (p. 1) that influence learning, there may be opportunities to structure studies in a way that documents the impact of changes to classroom designs, faculty development, and the facilities planning process.

Classroom Design. Based on data from this study or building off new data from subsequent, repeated measures or in-depth qualitative exploration studies, it may be beneficial to test specific classroom design feature changes for impact on and support of

student learning experiences. For example, a suggestion noted by participants in this study was that adding ramps to lecture halls might improve access to seating locations throughout the room for users with mobility issues without negatively impacting classroom users without mobility issues. Research is needed to verify whether those assumptions hold true for all users and what impact adding a ramp has for all classroom users and their learning experiences. Additionally, participants identified classroom design improvements in conjunction with new construction projects. This may warrant a study focusing on these new classroom designs and alignment with pedagogy needs, drawing on the expertise of architects, facilities planners, and education leaders. Structuring studies grounded in the Theory of Affordances and concepts of Universal Design for Physical Spaces may present opportunities for such ongoing research in classroom design (Design for Human Diversity, n.d.; Gibson, 2015; Story et al., 1998).

Faculty Development. Another opportunity for intervention research is in the realm of faculty development. Participants in this study suggested institutional infrastructure influenced their experiences with classroom design and learning, and a primary driver for these issues were education and training gaps — particularly for faculty. Research is needed to explore the underlying issues that influence this outcome and explore possible interventions to improve them. Designing studies grounded in concepts from Universal Design for Learning practices may facilitate this exploration in this research area (Meyer et al., 2016).

Another example of intervention research related to faculty development is to explore current standards for supporting students with disabilities established at a particular university, then collect student feedback on their effectiveness, and test interventions that support faculty in meeting standards that best support students.

Similarly, a third example might be to explore what faculty development programming is available to new or existing faculty, introduce programming changes (e.g., best practices for classroom technology usage that also supports students with disabilities), and collect feedback on the effectiveness of those changes. Finally, a fourth option might be to explore the connection between instructional design and classroom design, working with faculty and administrators to administer instructional design interventions that align their instructional goals and learning objectives to physical space requirements.

Facilities Planning Process. Finally, conducting research on the facilities planning process is a third area which may yield targeted benefits for multiple stakeholder groups including classroom users (e.g., faculty and students), administrators, and facilities planners. Based on the results in this study, a review of the existing planning process at universities may identify opportunities for change. Exploring issues related to who is included in the planning process, how accessibility standards are incorporated in the planning process, and the intersection of physical space and learning are three topic areas for generating new data sources. From those preliminary studies, further investigation of targeted interventions and the resulting impact of those changes may promote ongoing improvements. There are a number of theoretical and conceptual foundations from which these studies may be derived, but coming from an instructional designer's perspective, General Systems Theory and concepts from Universal Design may help orient such intervention research (Meyer et al., 2016; Richey et al., 2011; Story et al., 1998).

Conclusion

As previously discussed, the purpose of the study was to explore the perspectives of undergraduate students served by the UGA DRC on how the physical classroom space

impacts learning for students with disabilities. The data suggests that eight classroom design features impacted student perceptions of their learning experiences in this case study, but the impact of those features may be relative to the individual and their respective needs. Four themes emerged from the data suggesting how these eight features impacted student perceptions of their learning. The results suggested that classroom design features may impact student attitudes, motivation, and achievement; their ability to sit in preferred seats that support learning and facilitate participation in class activities; strategies for studying and learning course content; and students' ability to focus on the instructor, instructional content, and class activities.

The implications for practice and further research presented in this chapter are merely a starting point for further exploration. This study presents wide-ranging opportunities for practitioners and researchers alike. A key takeaway of this study is the importance of continued progress to design classrooms that support inclusivity. One participant summarized the challenges students experience today, but the optimism for the future as she stated, "I just really look forward to a day where accessibility is expected and understood rather than being an afterthought." It is my hope that this study provides a starting point for dialogue and change.

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APPENDIX A

Pilot Study: Preliminary Focus Group Recruitment Email Template

The following email template was used to recruit Speakers Bureau members served by

the UGA DRC to participate in the pilot study's preliminary focus group during which a

draft to the survey instrument would be reviewed for feedback.

Good morning,

My name is Beth Woods, and I am a fourth-year doctoral student conducting my
dissertation research under the direction of Dr. Janette Hill in the College of Education at
UGA. I am interested in understanding how you believe classroom design features impact
your learning experience.

I am seeking voluntary participation from up to five undergraduate students who have a
declared disability and are members of the Speakers Bureau from the Disability Resource
Center to participate in a one-hour preliminary focus group interview. During this focus
group session, you will have the opportunity to review a proposed survey draft and
provide feedback. The survey will be modified based your feedback before the survey is
distributed to all Speakers Bureau members. The purpose of the survey is to collect data
about how classroom design features impact your learning experience, and follow-up
focus groups will be scheduled discuss changes to classroom design features that might
better support your learning experiences.

Preliminary Focus Group Information

Date: Wednesday, March 28
Time: 4:30 p.m. – 5:30 p.m.
Location: Disability Resource Center Conference Room
Participation: Seeking 4-5 participants

If you would like to participate in the preliminary focus group to review and provide
feedback about the survey, please contact me at brwoods@uga.edu to sign-up to attend.

I have attached a copy of the informed consent form for your reference.

Thank you for considering participating in the study!

Beth Woods
brwoods@uga.edu

APPENDIX B

Pilot Study: Survey Recruitment Email Template

The following email template was used to recruit Speakers Bureau members served by

the UGA DRC to complete the pilot study's revised online survey.

Good morning,

My name is Beth Woods, and I am a fourth year doctoral student conducting my dissertation research under the direction of Dr. Janette Hill in the College of Education at UGA. I am interested in understanding how you believe classroom design features impact your learning experience.

I am seeking voluntary participation from undergraduate students who have a declared disability and are members of the Speakers Bureau from the Disability Resource Center to complete a brief online survey. Survey respondents are also invited to participate in follow-up focus groups to discuss the survey's results, provide feedback about how classroom design features impact your learning experiences, and discuss changes to classroom design features that might better support your learning experiences.

The survey is available through Wednesday, April 11, and it is expected to take no longer than 15-20 minutes.

Here is the survey link:

https://ugeorgia.qualtrics.com/jfe/form/SV_bKIOixvRY0JjTkV

I have attached a copy of the informed consent form for your reference.

Thank you for considering participating in the study!

Beth Woods

APPENDIX C

Pilot Study: Follow-up Focus Group Recruitment Email Template

The following email template was used to recruit Speakers Bureau members served by

the UGA DRC to attend the pilot study's follow-up focus group sessions.

Good afternoon,

Thank you for your recent participation in my survey! In follow-up, I am seeking
voluntary participation from undergraduate students who have a declared disability and
are members of the Speakers Bureau from the Disability Resource Center to participate in
a one-hour focus group interview. Participants will have the opportunity to review and
discuss the survey's results, provide feedback about how classroom design features
impact your learning, and discuss changes to classroom design features that might better
support your learning.

The focus groups are scheduled as follows:

1. Tuesday, April 17, 12:30 – 1:30 p.m., Disability Resource Center small
   conference room
2. Tuesday, April 17, 4:00 – 6:00 p.m., Disability Resource Center conference room
3. Wednesday, April 18, 4:00 – 6:00 p.m., Disability Resource Center conference
   room

** Please note – if you would like to participate but these times do not fit with your
schedule, please email me and let me know your availability. I may be able to add an
additional focus group session.

Please contact me directly at brwoods@uga.edu to sign-up to attend one of the sessions.

I have attached a copy of the informed consent form for your reference.

Thank you for considering participating in the study!

Beth Woods

APPENDIX D

Pilot Study: Preliminary Survey Instrument

The following is the first draft of the survey instrument. It was presented to Speakers

Bureau members attending the preliminary focus group and later revised based on

feedback collected during that session.

Start of Block: Introduction

Q1

Dear participant:

I am a graduate student under the direction of Dr. Janette Hill in the Learning, Design, and Technology program at The University of Georgia. I invite you to participate in a research study entitled Rethinking Classroom Design. The purpose of this study is to understand how undergraduate students with disabilities perceive classroom design features that may impact their learning.

Participants in this study should be undergraduate students at the University of Georgia who have a declared disability and are members of the Speakers Bureau from the Disability Resource Center. Your decision about whether or not to participate will have no bearing on your grades, class standing, or the services you receive from the Disability Resource Center.

Your participation may involve participating in a preliminary focus group (4-5 participants) to review and provide feedback about the study's survey prior to distribution. All participants will have the option to complete an online survey and should only take about 15-20 minutes to complete. All participants also have the option to volunteer to participate in a one-hour focus group during which the survey's results will be discussed and your feedback will be solicited. Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time without penalty or loss of benefits to which you are otherwise entitled. If you decide to stop or withdraw from the study, the information/data collected from or about you up to the point of your withdrawal will be kept as part of the study and may continue to be analyzed.

Audio recording devices will be used during the focus group sessions in order to create transcripts for data analysis. Recordings will be archived after transcription and destroyed following the completion of the study. All information collected in this study that can be identified as yours will remain confidential, unless required by law. No individually-

identifiable information about you, or provided by you during the research, will be shared with others without your written permission. All research data will be kept on a private drive that only the researchers will have access to. Identifying information of participants will be removed from any reports that are seen by anyone other than the researchers. The results of the research study may be published, but your name or any identifying information will not be used.

If you participate in the survey, note that every reasonable effort has been taken to ensure the effective use of available technology; however, confidentiality during online communication cannot be guaranteed. If you participate in the focus group, I will keep your comments confidential, but I can't promise that other focus group participants will keep the information confidential. I will ask all participants to respect the confidentiality of others by not revealing who participated in the focus group and by not discussing what was said in the group.

Your opinions are highly valued. The findings from this project may provide information on classroom design, accessibility issues, and the diverse needs of learners. There are some minimal risks or discomforts associated with this research. They include the collection of sensitive information including name, email address, and self-identified disabilities; however, measures are taken to protect your responses. All data will be contained in systems or files using strong passwords and maintained only for the duration of this study. All identifying information will be destroyed three years following the conclusion of the study (anticipated July 2021).

If you have any questions about this research project, please feel free to contact me, Beth Woods, at brwoods@uga.edu. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, Athens, Georgia 30602; telephone (706) 542-3199; email address irb@uga.edu.

By participating in the focus groups and/or clicking on the "I agree" button to participate in the survey, you are agreeing to participate in the above described research project.

Thank you for your consideration! Please print a copy this letter for your records.

Sincerely,

Elizabeth R. Woods

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

- o   I agree, begin the study (1)

- o   I do not content, I do not wish to participate (2)

Skip To: End of Survey If Dear participant: I am a graduate student under the direction

of Dr. Janette Hill in the Learning... = I do not content, I do not wish to participate

End of Block: Introduction

Start of Block: Participant Demographics

PD1 **Participant Demographics**

All fields are required unless otherwise noted.

PD2 Gender

- o   Female (1)

- o   Male (2)

- o   Non-binary/third gender (3)

- o   Prefer to self-describe (4) _____

- o   Prefer not to answer (5)

PD3 Race/Ethnicity

- o   American Indian or Alaska Native (1)

- o   Asian (2)

- o   Black or African American (3)

- o   Hispanic or Latino (4)

- o   Native Hawaiian or Other Pacific Islander (5)

- o   White (6)

- o   Other (7) _____

- o   Prefer not to answer (8)

PD4 Major _____

PD5 Year in School

- o   Freshman (1)

- o   Sophomore (2)

○ Junior (3)

○ Senior (4)

○ Prefer not to answer (5)

PD6 Identified Disability (check all that apply)

☐ ADHD (1)

☐ Autism Spectrum (2)

☐ Brain Injury (3)

☐ Chronic Health (4)

☐ Communication (5)

☐ Learning Disability (6)

☐ Muscular Skeletal (7)

☐ Neurological (8)

☐ Psychological (9)

☐ Visual (10)

☐ Other (11) _____

☐ Prefer not to answer (12)

End of Block: Participant Demographics

Start of Block: Classroom Design Elements That Impact Your Learning

CD1 **Classroom Design Elements That Impact Your Learning**

Indicate to what extent you perceive the following classroom design elements impact

your learning. Use the scale where 1 is low (least impact) and 5 is high (most impact).

Mark "N/A" if this is not applicable to you. All fields are required.

CD2 Indicate to what extent you perceive the following classroom design elements impact your learning. Use the scale where 1 is low (least impact) and 5 is high (most impact). Mark "N/A" if this is not applicable to you. All fields are required.

	1 (Least Impact) (1)	2 (Some Impact) (2)	3 (Moderate Impact) (3)	4 (High Impact) (4)	5 (Most Impact) (5)	N/A (6)
Access/Paths of Navigation/Seating Locations (1)	o	o	o	o	o	o
Acoustics/Availability of microphones/Availability of assistive listening devices (2)	o	o	o	o	o	o
Furniture (3)	o	o	o	o	o	o
Lighting (4)	o	o	o	o	o	o
Lines of sight/Ability to see instructor/Ability to see projected content (5)	o	o	o	o	o	o
Temperature (6)	o	o	o	o	o	o

End of Block: Classroom Design Elements That Impact Your Learning

Start of Block: Classroom Design Elements That Support Your Learning

CS1 **Classroom Design Elements That Support Your Learning**

For the classroom design elements that you indicated as "4 or 5" regarding their impact on your learning, please answer the following questions as applicable. All fields are required.

Display This Question:

If Indicate to what extent you perceive the following classroom design elements impact your learning... = Access/Paths of Navigation/Seating Locations [4 (High Impact)]

Or Indicate to what extent you perceive the following classroom design elements impact your learning... = Access/Paths of Navigation/Seating Locations [5 (Most Impact)]

CS2 Access/Paths of navigation/Seating Locations

The following are access and seating options available at UGA for use in classrooms.
What would be the ideal access and/or seating options in a classroom for you? (Check all that apply)

- ☐   Wide aisles (1)

- ☐   Wide turning radius (2)

- ☐   Seating options at end of aisles (3)

- ☐   Seating options at the front of the room (4)

- ☐   Seating options at the middle of the room (5)

- ☐   Seating options at the back of the room (6)

- ☐   Other (7) _____

Display This Question:

If Indicate to what extent you perceive the following classroom design elements impact your learning... = Acoustics/Availability of microphones/Availability of assistive listening devices [4 (High Impact)]

Or Indicate to what extent you perceive the following classroom design elements impact your learning... = Acoustics/Availability of microphones/Availability of assistive listening devices [5 (Most Impact)]

CS3 Acoustics/Availability of microphones and/or assistive listening devices

The following are acoustical treatment options available at UGA for use in classrooms.
What would be the ideal acoustical treatment options in a classroom for you? (Check all that apply)

☐ Carpet flooring (1)

☐ Tile flooring (2)

☐ Hardwood flooring (3)

☐ Acoustical tiles/wall treatments for sound dampening (4)

☐ Assisted listening devices available in the room (5)

☐ Assisted listening devices compatible with hearing aid technology (6)

☐ Instructor microphones (7)

☐ Student microphones (8)

☐ Other (9) _____

Display This Question:

If Indicate to what extent you perceive the following classroom design elements impact

your learning... = Furniture [4 (High Impact)]

Or Indicate to what extent you perceive the following classroom design elements impact

your learning... = Furniture [5 (Most Impact)]

CS4 **Furniture**

The following are furniture options available at UGA for use in classrooms. What would

be the ideal furniture option in a classroom for you? (Check all that apply)

☐ Stadium style seating (e.g., lecture hall) (1)

☐ Table seating and chairs (e.g., seminar classroom) (2)

☐ Individual desks, fixed to the floor (e.g., small lecture classrooms) (3)

☐ Individual desks with chairs attached, mobile (e.g., small lecture classrooms) (4)

☐ Individual desks and chairs, mobile (e.g., small lecture classrooms) (5)

☐ Other (6) _____

Display This Question:

If Indicate to what extent you perceive the following classroom design elements impact

your learning... = Lighting [4 (High Impact)]

Or Indicate to what extent you perceive the following classroom design elements impact

your learning... = Lighting [5 (Most Impact)]

CS5 **Lighting**

The following are lighting options available at UGA for use in classrooms. What would

be the ideal lighting option in a classroom for you? (Check all that apply)

☐ Bright fluorescent (1)

☐ LED lighting (2)

☐ Dimmable (3)

☐ Other (4) _____

Display This Question:

If Indicate to what extent you perceive the following classroom design elements impact

your learning... = Lines of sight/Ability to see instructor/Ability to see projected content [

4 (High Impact)]

Or Indicate to what extent you perceive the following classroom design elements impact

your learning... = Lines of sight/Ability to see instructor/Ability to see projected content [

5 (Most Impact)]

CS6 **Lines of sight/Ability to see instructor, classmates, or projected content**

The following are line of sight options available at UGA for use in classrooms. What

would be the ideal line of sight option in a classroom for you? (Check all that apply)

☐ Instructor at the front of the room with projection on either side of the instructor

podium (1)

☐ Instructor in the center of the room with projection/monitors distributed around the room (2)

☐ Other (3) _____

Display This Question:

If Indicate to what extent you perceive the following classroom design elements impact your learning... = Temperature [4 (High Impact)]

Or Indicate to what extent you perceive the following classroom design elements impact your learning... = Temperature [5 (Most Impact)]

CS7 **Temperature**

The following are temperature options available at UGA for use in classrooms. What would be the ideal temperature option in a classroom for you? What would be the ideal temperature range in a classroom for you? (Check all that apply)

☐ 60-64 degrees Fahrenheit (1)

☐ 65-69 degrees Fahrenheit (2)

☐ 70-74 degrees Fahrenheit (3)

☐ 75-79 degrees Fahrenheit (4)

☐ Other (5) _____

End of Block: Classroom Design Elements That Support Your Learning

Start of Block: Open-Ended Questions

OE1 The following open-ended questions are optional.

OE2 What other classroom design features do you perceive impact your learning?

_____

OE3

What else would you like to share about classroom design and your learning?

_____

End of Block: Open-Ended Questions

Start of Block: Invitation to Participate in Focus Groups

FG1 **Volunteer to Participate in Focus Groups**   In follow-up to this survey, you are invited to participate in one of three focus group interviews:

April 16, 2018, 4:30 - 5:30 p.m., Disability Resource Center Conference Room

April 17, 2018, 4:30 - 5:30 p.m., Disability Resource Center Conference Room

April 18, 2018, 4:30 - 5:30 p.m., Disability Resource Center Conference Room

During each focus group session, the results of this survey will be presented, and you will have an opportunity to share additional feedback about how the identified classroom design features impact your learning and what changes to classroom designs might better support your learning.   If you would like to volunteer to participate in one of the focus group sessions, please share your first name and email address.

- o   First Name (1) _____

- o   Email address (2) _____

Q23 Which dates are you available to attend? (Check all that apply.)

☐ Monday, April 16, 2018, 4:30 - 5:30 p.m. (1)

☐ Tuesday, April 17, 2018, 4:30 - 5:30 p.m. (2)

☐ Wednesday, April 18, 2018, 4:30 - 5:30 p.m. (3)

☐ None of the dates listed work for me, but I'm available the following dates/times

the week of April 16 - 20: (4) _____

End of Block: Invitation to Participate in Focus Groups

APPENDIX E

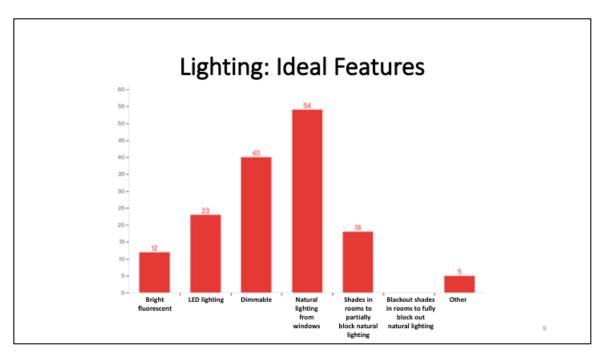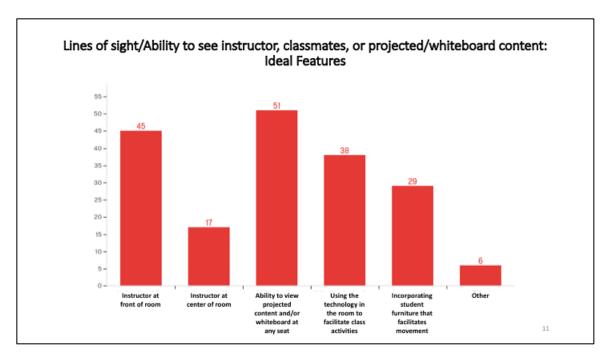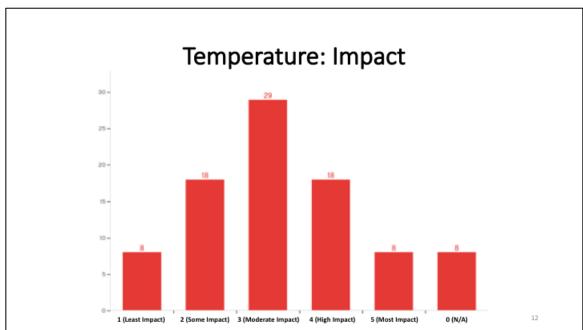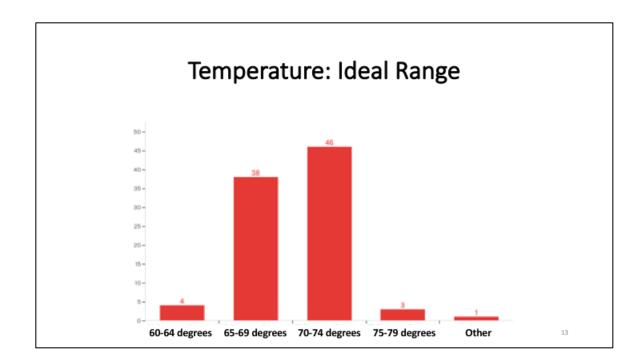Pilot Study: Preliminary Focus Group Presentation and Protocol

The following content was presented in a PowerPoint presentation for the Preliminary

Focus Group. The first five slides provided contextual information, and the sixth slide

served as the focus group session's discussion protocol.

Preliminary Focus Group Logistics

- **Purpose:** To collect feedback about my proposed survey
- **Duration:** 1 hour
- **Data:** Notes and audio will be recorded during the focus group session
- **Confidentiality:**
  - I am committed to creating a safe climate for discussion and maintaining confidentiality
  - I ask that focus group participants respect the confidentiality of others by not revealing who participated or what was said
- **Accommodations:** Materials will be projected and print versions provided. If you have accommodation needs, please let me know.

Overview of the Study

- The study is guided by three research questions:

  1. To what extent do students believe the design of a classroom space impacts learning experiences?

  2. What classroom design features do students identify as impacting their learning experiences?

  3. How do these identified classroom design features impact students' perceptions of their learning experiences?

Study Structure

1. Preliminary Focus Group (YOU ALL!) ☺
   - Open to 4-5 Speakers Bureau members
   - Review the survey and provide feedback
2. Survey
   - Submitted to all Speakers Bureau members
   - Addresses research questions #1 & #2
3. Follow-up Focus Groups
   - Open to all Speakers Bureau members
   - Addresses research question #3

Survey Structure

1. **Informed Consent** - required
2. **Participant Demographics** - captures participant demographics that may be relevant to the study's results and/or to future research
3. **Classroom Design Features that Impact Your Learning** – participants identify classroom design features that impact their learning and quantify their impact, ranking them from least to most impact
4. **Classroom Design Features that Support your Learning** – participants who select high or most impact (4 or 5) in section three (Classroom Design Features that Impact Your Learning) are asked to indicate features that would support their learning.
5. **Open Ended Questions** – participants are asked identify features that might not be capture by the survey questions and provide additional feedback relevant to the survey.

Focus Group Questions

1. [Review each question starting at Section 3] Are there features you would add or modifications to this question that you would suggest?

2. Based on your experience, does the survey capture the classroom design features most relevant to students served by the DRC?

3. Is the survey structure clear and well-organized? Are there modifications you would suggest?

4. Is the survey content clear and easy to understand? Are there modifications you would suggest?

5. Is the survey length appropriate? Are there modifications you would suggest?

6. What other questions or comments do you have about the survey?

APPENDIX F

Pilot Study: Revised Survey Instrument

The following is the revised of the survey instrument. It was corrected based on feedback

collected from Speakers Bureau members during the preliminary focus group. This

survey was distributed during the pilot study and again during the dissertation study's

data collection period.

Start of Block: Introduction

Q1

Dear participant:

I am a graduate student under the direction of Dr. Janette Hill in the Learning, Design, and Technology program at The University of Georgia. I invite you to participate in a research study entitled *Rethinking Classroom Design*. The purpose of this study is to understand how undergraduate students with disabilities perceive classroom design factors that impact their learning.

Participants in this study should be undergraduate students at the University of Georgia who have a declared disability and have registered for services from the Disability Resource Center. Your decision about whether or not to participate will have no bearing on your grades, class standing, or the services you receive from the Disability Resource Center.

Your participation may involve participating in a preliminary focus group (4-5 participants) to review and provide feedback about the study's survey prior to distribution. Your participation will involve completing an online survey and should only take about 5-10 minutes to complete. You also have the option to volunteer to participate in a one-hour focus group during which the survey's results will be discussed and your feedback will be solicited. Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time without penalty or loss of benefits to which you are otherwise entitled. If you decide to stop or withdraw from the study, the information/data collected from or about you up to the point of your withdrawal will be kept as part of the study and may continue to be analyzed.

Audio recording devices will be used during the focus group sessions in order to create transcripts for data analysis. Recordings will be archived after transcription and destroyed

following the completion of the study. All information collected in this study that can be identified as yours will remain confidential, unless required by law. No individually-identifiable information about you, or provided by you during the research, will be shared with others without your written permission. All research data will be kept on a private drive that only the researchers will have access to. Identifying information of participants will be removed from any reports that are seen by anyone other than the researchers. The results of the research study may be published, but your name or any identifying information will not be used.

If you participate in the survey, note that every reasonable effort has been taken to ensure the effective use of available technology; however, confidentiality during online communication cannot be guaranteed. If you participate in the focus group, I will keep your comments confidential, but I can't promise that other focus group participants will keep the information confidential. I will ask all participants to respect the confidentiality of others by not revealing who participated in the focus group and by not discussing what was said in the group.

Your opinions are highly valued. The findings from this project may provide information on classroom design, accessibility issues, and the diverse needs of learners. There are some minimal risks or discomforts associated with this research. They include the collection of sensitive information including name, email address, and self-identified disabilities; however, measures are taken to protect your responses. All data will be contained in systems or files using strong passwords and maintained only for the duration of this study. All identifying information will be destroyed at the conclusion of the study (anticipated December 2021).

If you have any questions about this research project, please feel free to contact me Beth Woods at brwoods@uga.edu. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, Athens, Georgia 30602; telephone (706) 542-3199; email address irb@uga.edu.

By participating in the focus groups and/or clicking on the "I agree" button to participate in the survey, you are agreeing to participate in the above described research project.

Thank you for your consideration! Please print a copy this letter for your records.

Sincerely,

Elizabeth R. Woods

- o   I agree, begin the study (1)

- o   I do not consent, I do not wish to participate (2)

Skip To: End of Survey If Dear participant: I am a graduate student under the direction

of Dr. Janette Hill in the Learning... = I do not consent, I do not wish to participate

End of Block: Introduction

Start of Block: Participant Demographics

PD1 **Participant Demographics**

All fields are required unless otherwise noted.

PD2 **Gender**

- Female (1)

- Male (2)

- Non-binary/third gender (3)

- Prefer to self-describe (4) _____

- Prefer not to answer (5)

PD3 **Race/Ethnicity**

- American Indian or Alaska Native (1)

- Asian (2)

- Black or African American (3)

- Hispanic or Latino (4)

- Native Hawaiian or Other Pacific Islander (5)

- White (6)

- Other (7) _____

- Prefer not to answer (8)

PD4 **Major** _____

PD5 **Year in School**

- First Year (1)

- Sophomore (2)

- Junior (3)

    ○   Senior (4)

    ○   Prefer not to answer (5)

PD6 Identified Disability (Select all that apply)

- ☐ ADHD (1)

- ☐ Anxiety Disorder (13)

- ☐ Autism Spectrum Disorders (2)

- ☐ Bipolar Disorder (14)

- ☐ Cancer (3)

- ☐ Cerebral Palsy (15)

- ☐ Crohn's Disease (16)

- ☐ Cystic Fibrosis (17)

- ☐ Depression (5)

- ☐ Epilepsy (4)

- ☐ Hearing Impairment/Deaf (18)

- ☐ Heart Disease (19)

- ☐ Learning Disabilities (6)

- ☐ Leukemia (20)

- ☐ Lupus (21)

- ☐ Lymphoma (22)

- ☐ Mobility Impairment (23)

- ☐ Multiple Sclerosis (24)

☐ Muscular Dystrophy (25)

☐ Narcolepsy (7)

☐ Obsessive Compulsive Disorder (26)

☐ Paraplegia (9)

☐ Post-Traumatic Stress Disorder (8)

☐ Rheumatoid Arthritis (27)

☐ Tourette Syndrome (28)

☐ Traumatic Brain Injury (29)

☐ Visual (10)

☐ Other (11) _____

☐ Prefer not to answer (12)

End of Block: Participant Demographics

Start of Block: Classroom Design Elements That Impact/Support Your Learning: Access

CD2 **Access/Paths of navigation/Seating Locations**

Indicate to what extent you perceive classroom **access** impacts your learning.

Use the scale where 1 is low (least impact) and 5 is high (most impact). Mark "N/A" if this is not applicable to you. All fields are required.

	1 (Least Impact) (1)	2 (Some Impact) (2)	3 (Moderate Impact) (3)	4 (High Impact) (4)	5 (Most Impact) (5)	N/A (6)
Access/Paths of Navigation/Seating Locations (1)	o	o	o	o	o	o

CS2

The following are access and seating options available at UGA for use in classrooms.

What would be the ideal access and/or seating options in a classroom for you? (Select all

that apply)

☐ Wide aisles (1)

☐ Wide turning radius (2)

☐ Ability to access all areas of the classroom (9)

☐ Seating options at end of aisles (3)

☐ Seating options at the front of the room (4)

☐ Seating options at the middle of the room (5)

☐ Seating options at the back of the room (6)

☐ Ability to sit in any seat in a classroom (8)

☐ Other (7) _____

End of Block: Classroom Design Elements That Impact/Support Your Learning: Access

Start of Block: Classroom Design Elements that Impact/Support Your Learning: Acoustics

Q24 Acoustics/Availability of microphones and/or assistive listening devices

Indicate to what extent you perceive classroom **acoustics** impacts your learning.

Use the scale where 1 is low (least impact) and 5 is high (most impact). Mark "N/A" if

this is not applicable to you. All fields are required.

	1 (Least Impact) (1)	2 (Some Impact) (2)	3 (Moderate Impact) (3)	4 (High Impact) (4)	5 (Most Impact) (5)	N/A (6)
Acoustics/Availability of microphones/Availability of assistive listening devices (2)	o	o	o	o	o	o

CS3

The following are acoustical treatment options available at UGA for use in classrooms.

What would be the ideal acoustical treatment options in a classroom for you? (Select all

that apply)

☐ Carpet flooring (1)

☐ Tile flooring (2)

☐ Hardwood flooring (3)

☐ Acoustical tiles/wall treatments for sound dampening (4)

☐ Assisted listening devices available in the room (5)

☐ Assisted listening devices compatible with hearing aid technology (6)

☐ Instructor microphones (7)

☐ Student microphones (8)

☐ Use of closed captioning services (10)

☐ Access for note taking services (11)

☐ Other (9) _____

End of Block: Classroom Design Elements that Impact/Support Your Learning:

Acoustics

Start of Block: Classroom Design Elements that Impact/Support Your Learning:

Furniture

Q25 **Furniture**

Indicate to what extent you perceive classroom **furniture** impacts your learning.

Use the scale where 1 is low (least impact) and 5 is high (most impact). Mark "N/A" if

this is not applicable to you. All fields are required.

	1 (Least Impact) (1)	2 (Some Impact) (2)	3 (Moderate Impact) (3)	4 (High Impact) (4)	5 (Most Impact) (5)	N/A (6)
Furniture (3)	o	o	o	o	o	o

CS4

The following are furniture options available at UGA for use in classrooms. What would

be the ideal furniture option in a classroom for you? (Select all that apply)

☐ Stadium style seating (e.g., lecture hall) (1)

☐ Table seating and chairs (e.g., seminar classroom) (2)

☐ Individual desks, fixed to the floor (e.g., small lecture classrooms) (3)

☐ Individual desks with chairs attached, mobile (e.g., small lecture classrooms) (4)

☐ Individual desks and chairs, mobile (e.g., small lecture classrooms) (5)

☐ Other (6) _____

End of Block: Classroom Design Elements that Impact/Support Your Learning:

Furniture

Start of Block: Classroom Design Elements that Impact/Support Your Learning:

Lighting

Q26 **Lighting**

Indicate to what extent you perceive classroom **lighting** impacts your learning.

Use the scale where 1 is low (least impact) and 5 is high (most impact). Mark "N/A" if

this is not applicable to you. All fields are required.

	1 (Least Impact) (1)	2 (Some Impact) (2)	3 (Moderate Impact) (3)	4 (High Impact) (4)	5 (Most Impact) (5)	N/A (6)
Lighting (4)	o	o	o	o	o	o

CS5

The following are lighting options available at UGA for use in classrooms. What would

be the ideal lighting option in a classroom for you? (Select all that apply)

☐ Bright fluorescent (1)

☐ LED lighting (2)

☐ Dimmable (3)

☐ Natural lighting from windows (5)

☐ Shades in rooms to partially block natural lighting (6)

☐ Blackout shades in rooms to fully block out natural lighting (7)

☐ Other (4) _____

End of Block: Classroom Design Elements that Impact/Support Your Learning:

Lighting

Start of Block: Classroom Design Elements that Impact/Support Your Learning:

Lines of Sight

Q27 **Lines of sight/Ability to see instructor, classmates, or projected/whiteboard**

content

Indicate to what extent you perceive the **lines of sight** (i.e., the ability to see the instructor, classmates, or projected/whiteboard content) impacts your learning.

Use the scale where 1 is low (least impact) and 5 is high (most impact). Mark "N/A" if this is not applicable to you. All fields are required.

	1 (Least Impact) (1)	2 (Some Impact) (2)	3 (Moderate Impact) (3)	4 (High Impact) (4)	5 (Most Impact) (5)	N/A (6)
Lines of sight/Ability to see instructor/Ability to see projected content (5)	o	o	o	o	o	o

CS6

The following are line of sight options available at UGA for use in classrooms. What would be the ideal line of sight option in a classroom for you? (Select all that apply)

☐ Instructor at the front of the room with projection on either side of the instructor podium (e.g., lecture hall) (1)

☐ Instructor in the center of the room with projection/monitors distributed around the room (e.g., SCALE-UP or active learning classroom) (2)

☐ Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor) (4)

☐ Using the technology in the room to facilitate class activities (e.g., presentation system, document camera, interactive tablet/touch screen for annotations, etc.) (5)

☐ Incorporating student furniture that facilitates movement (e.g., adjustable chairs, chairs that swivel, chairs on casters, etc.) (6)

☐ Other (3) _____

End of Block: Classroom Design Elements that Impact/Support Your Learning: Lines of Sight

Start of Block: Classroom Design Elements that Impact/Support Your Learning: Temperature

Q28 **Temperature**

Indicate to what extent you perceive classroom **temperature** impacts your learning. Use the scale where 1 is low (least impact) and 5 is high (most impact). Mark "N/A" if this is not applicable to you. All fields are required.

	1 (Least Impact) (1)	2 (Some Impact) (2)	3 (Moderate Impact) (3)	4 (High Impact) (4)	5 (Most Impact) (5)	N/A (6)
Temperature (6)	o	o	o	o	o	o

CS7

The following are temperature options available at UGA for use in classrooms. What would be the ideal temperature option in a classroom for you? What would be the ideal temperature range in a classroom for you? (Check all that apply)

☐ 60-64 degrees Fahrenheit (feels like the air conditioner is on full blast in summer, or the heat is turned off in winter) (1)

☐ 65-69 degrees Fahrenheit (feels like the air conditioner is cold, but not blowing at full blast in the summer, or the heat is turned on to low in winter) (2)

☐ 70-74 degrees Fahrenheit (feels like the air conditioner is cool in the summer, or the heat is turned on to warm in the winter) (3)

☐ 75-79 degrees Fahrenheit (feels like the air conditioner is turned off in summer, or

the heat is on full blast in winter) (4)

☐ Other (5) _____

End of Block: Classroom Design Elements that Impact/Support Your Learning:

Temperature

Start of Block: Open-Ended Questions

OE1 The following open-ended questions are optional.

OE2 What other **classroom design features** do you perceive impact your learning?

_____

OE3

What else would you like to share about **classroom design and your learning**?

_____

End of Block: Open-Ended Questions

Start of Block: Invitation to Participate in Focus Groups

Q26

Click the next button to submit your survey responses

FG1 **Volunteer to Participate in the Follow-Up Focus Group**

In follow-up to this survey, you are invited to participate in a focus group interview

scheduled after the Speakers Bureau kick-off meeting.

<u>**Focus Group Information**</u>

Wednesday, September 5, 2018

5:00 - 6:00 p.m.

Tate Student Center

Rooms 144 & 145

Food will be provided by the Disability Resource Center

During the focus group session, the results of this survey will be presented, and you will have an opportunity to share additional feedback about how the identified classroom design features impact your learning and what changes to classroom designs might better support your learning.

Q24

Experiential Learning Credit

If you are a member of the Disability Resource Center's Speakers Bureau and would like to obtain 1 hour of experiential learning credit for completing the survey, **please print out or take a screen shot of this page and bring it with you to the kick-off meeting on Wednesday, September 5th at 3:00 p.m. in the Tate Student Center, rooms 144 & 145.**

${date://CurrentDate/FL}, ${date://CurrentTime/ST}

${rand://int/0:10000}

Speakers Bureau members that participate in the follow-up focus group interview after the kick-off meeting will receive an **additional 1 hour of experiential learning credit**. Food will be provided by the Disability Resource Center.

Participation in the survey and focus group is optional. There will be additional Speakers Bureau activities, such as monthly workshops, self-directed learning modules, and panel discussions with the university community, during which equivalent experiential learning credit may be earned.

Q25

Click the next button to submit your survey responses

End of Block: Invitation to Participate in Focus Groups

APPENDIX G

Pilot Study: Follow-up Focus Group Presentation and Protocol

The following content was presented in a PowerPoint presentation for the pilot study's Follow-up Focus Group. The first four slides provided contextual information, and the remaining slides served as the focus group session's discussion protocol.

Rethinking Classroom Design

Beth Woods

Dr. Janette Hill, College of Education

Follow-up Focus Group Logistics

- **Purpose:** To review survey results, collect feedback on how classroom design features impact your learning, and discuss changes to classroom design features that might better support your learning
- **Duration:** 1 hour
- **Data:** Notes and audio will be recorded during the focus group session
- **Confidentiality:**
  - I am committed to creating a safe climate for discussion and maintaining confidentiality
  - I ask that focus group participants respect the confidentiality of others by not revealing who participated or what was said
- **Accommodations:** Materials will be projected and print versions provided. If you have accommodation needs, please let me know.

Overview of the Study

- The study is guided by three research questions:

  1. To what extent do students believe the design of a classroom space impacts learning experiences?

  2. What classroom design features do students identify as impacting their learning experiences?

  3. How do these identified classroom design features impact students' perceptions of their learning experiences?

Survey Structure

1. **Informed Consent** - required
2. **Participant Demographics** - captured participant demographics that may be relevant to the study's results and/or to future research
3. **Classroom Design Features that Impact/Support Your Learning** – participants identified classroom design features that impact their learning and quantified their impact, ranking them from least to most impact. Participants were then asked to indicate features that would support their learning.
4. **Open Ended Questions** – participants were asked to identify features that might not be captured by the survey questions and provide additional feedback relevant to the survey.

Classroom Design Features with the Most Impact

Classroom Design Feature	Mean Response	Impact
Access	3.667	Moderate – High
Furniture	3.571	Moderate – High
Lines of Sight	3.375	Moderate – High
Acoustics	3.000	Moderate
Lighting	2.500	Some – Moderate
Temperature	2.500	Some – Moderate

Question: How relevant are these features to your learning?

Ideal Classroom Design Features

Category	Feature	Count
Temperature	70-74 degrees	7
Access	Seating: Front of Room	6
Access	Seating: All Seats	6
Acoustics	Note Taking Services	6
Lighting	Natural Lighting/Windows	6
Furniture	Desks w/ Chairs (Not Attached)	5
Lines of Sight	Ability to view content from seat	5
Acoustics	Instructor Microphones	4
Furniture	Tables & Chairs	4
Lighting	Dimmable	4
Lines of Sight	Instructor at Front	4
Lines of Sight	Use of technology	4

Questions:
- **What are the most important classroom design features for your learning? Why?**
- **How do these impact your learning?**
- **Can you tell me a story or provide an example of how your learning was impacted?**

Classroom Examples

Lecture Hall   Tables & Chairs   Desks

Question: Here are three pictures of typical classrooms on campus. What types of classrooms do you find facilitate your learning?

Question: For a large lecture classroom, what are the ideal design features for your learning?

Question: For classrooms with tables, what are the ideal design features for your learning?

Classrooms with Desks

Desks

Question: For classrooms with desks, what are the ideal design features for your learning?

Open Ended Feedback

What else would you like to tell me about how classroom design impacts your learning?

Question: What else would you like to tell me about how classroom design impacts your learning?

APPENDIX H

Pilot Study: Follow-up Focus Group Handout

The following content was presented as a handout for the pilot study's Follow-up Focus

Group. The data presented summarized the results of the pilot study's survey.
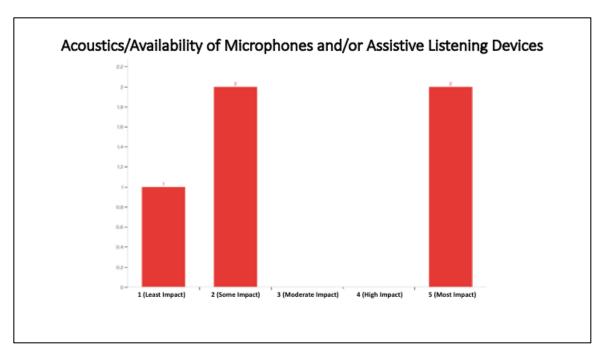
Survey Results Summary

Beth Woods

Dr. Janette Hill, College of Education

Access/Paths of Navigation/Seating Location

Access/Paths of Navigation/Seating Location

Acoustics/Availability of Microphones and/or Assistive Listening Devices

Acoustics/Availability of Microphones and/or Assistive Listening Devices

Lighting

Lighting

Lines of sight/Ability to see instructor, classmates, or projected/whiteboard content

Lines of sight/Ability to see instructor, classmates, or projected/whiteboard content

Temperature

Temperature

APPENDIX I

Survey Recruitment Email Templates

The following email templates were used to recruit undergraduate student participants

served by the UGA DRC to complete the study's online survey.

Initial Email

Good morning,

My name is Beth Woods, and I am a doctoral student conducting my dissertation research under the direction of Dr. Janette Hill in the College of Education at UGA. I am interested in understanding how you believe classroom design features impact your learning experience.

I am seeking voluntary participation from undergraduate students who have a declared disability and have registered for services from the Disability Resource Center to complete a brief online survey. The survey is available through **Saturday, September 1, 2018,** and it is expected to take no longer than 5-10 minutes. I have attached a copy of the informed consent form for your reference.

Here is the survey link:

https://ugeorgia.ca1.qualtrics.com/jfe/form/SV_0HTyTMWjf5eJB09

Survey respondents are also invited to participate in a focus group to discuss the survey's results, provide feedback about how classroom design features impact your learning experiences, and discuss changes to classroom design features that might better support your learning. (See attached flyer for details.)

Thank you for considering participating in the study!

Beth Woods
Reminder Email

Reminder Email

Good morning,

This is a reminder that I am seeking voluntary participation from undergraduate students

who have a declared disability and have registered for services from the Disability Resource Center to complete a brief online survey.

The survey is available through **Saturday, September 1, 2018**, and it should take about 5-10 minutes to complete.

Here is the survey link:

https://ugeorgia.ca1.qualtrics.com/jfe/form/SV_0HTyTMWjf5eJB09

Survey respondents are also invited to participate in a focus group to discuss the survey's results and provide additional feedback. (See attached flyer for details.)

I hope you will consider participating before the survey closes!

Beth Woods

APPENDIX J

IRB Consent Form

August 20, 2018

Dear participant:

I am a graduate student under the direction of Dr. Janette Hill in the Learning, Design, and Technology
program at The University of Georgia. I invite you to participate in a research study entitled Rethinking
Classroom Design. The purpose of this study is to understand how undergraduate students with disabilities perceive classroom design factors that impact their learning.

Participants in this study should be undergraduate students at the University of Georgia who have a declared disability and have registered for services from the Disability Resource Center. Your decision about whether or not to participate will have no bearing on your grades, class standing, or the services you receive from the Disability Resource Center.

Your participation may involve participating in a preliminary focus group (4-5 participants) to review and provide feedback about the study's survey prior to distribution. Your participation will involve completing an online survey and should only take about 5-10 minutes to complete. You also have the option to volunteer to participate in a one-hour focus group during which the survey's results will be discussed and your feedback will be solicited. Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time without penalty or loss of benefits to which you are otherwise entitled. If you decide to stop or withdraw from the study, the information/data collected from or about you up to the point of your withdrawal will be kept as part of the study and may continue to be analyzed.

Audio recording devices will be used during the focus group sessions in order to create transcripts for data analysis. Recordings will be archived after transcription and destroyed following the completion of the study. All information collected in this study that can be identified as yours will remain confidential, unless required by law. No individually-identifiable information about you, or provided by you during the research, will be shared with others without your written permission. All research data will be kept on a private drive that only the researchers will have access to. Identifying information of participants will be removed from any reports that are seen by anyone other than the researchers. The results of the research study may be published, but your name or any identifying information will not be used.

If you participate in the survey, note that every reasonable effort has been taken to ensure the effective use of available technology; however, confidentiality during online communication cannot be guaranteed. If you participate in the focus group, I will keep your comments confidential, but I can't promise that other focus group participants will keep the information confidential. I will ask all participants to respect the confidentiality of others by not revealing who participated in the focus group and by not discussing what was said in the group.

Your opinions are highly valued. The findings from this project may provide information on classroom design, accessibility issues, and the diverse needs of learners. There are some minimal risks or discomforts associated with this research. They include the collection of sensitive information including name, email address, and self-identified disabilities; however, measures are taken to protect your responses. All data will be contained in systems or files using strong passwords and maintained only for the duration of this study. All identifying information will be destroyed at the conclusion of the study (anticipated December 2021).

If you have any questions about this research project, please feel free to contact me Beth Woods at brwoods@uga.edu. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, Athens, Georgia 30602; telephone (706) 542-3199; email address irb@uga.edu.

By participating in the focus groups and/or clicking on the "I agree" button to participate in the survey, you are agreeing to participate in the above described research project.

Thank you for your consideration! Please print a copy this letter for your records.

Sincerely,

Elizabeth R. Woods

APPENDIX K

Focus Group Participant Recruitment Flyer

Rethinking Classroom Design

In follow-up to this survey, you are invited to participate in a focus group interview scheduled after the Speakers Bureau kick-off meeting!

Focus Group Information

Wednesday, September 5, 2018
5:00 - 6:00 p.m.
Tate Student Center
Rooms 144 & 145

*** Food will be provided by the Disability Resource Center ***
What to expect during the focus group session:

- The results of the survey will be presented to you

- You will have an opportunity to share additional feedback about how the identified classroom design features impact your learning

- You will be invited to share what changes to classroom designs might better support your learning

APPENDIX L

Second Focus Group Recruitment Email Template

Good afternoon,

In follow-up to my dissertation research study conducted in collaboration with the Disability Resource Center (DRC) this fall, I am seeking voluntary participation in a one hour focus group with up to 8 undergraduate students who have a declared disability and have registered for services from the DRC for any of the following disability categories:

- Attention Deficit Hyperactivity Disorder (ADHD)
- Psychological Disabilities (e.g., anxiety disorder, bipolar disorder, depression, obsessive compulsive disorder, PTSD, etc.)
- Learning Disabilities
- Autism Spectrum Disorders

Please email me by Thursday, November 5th at brwoods@uga.edu if you are interested in participating.

Thank you for considering participating in the study!

Beth Woods

APPENDIX M

Focus Group Handout

The following content was presented as a handout for the study's two Focus Group

sessions. The data presented summarized the results of the study's survey.
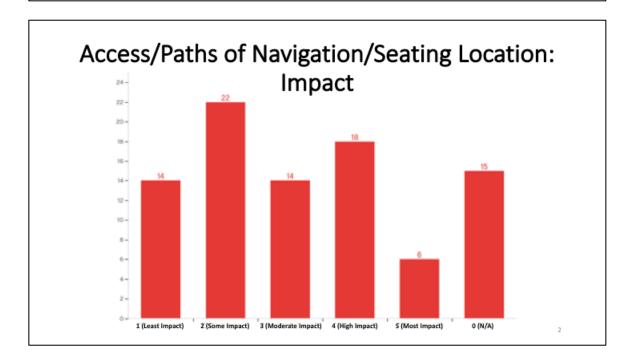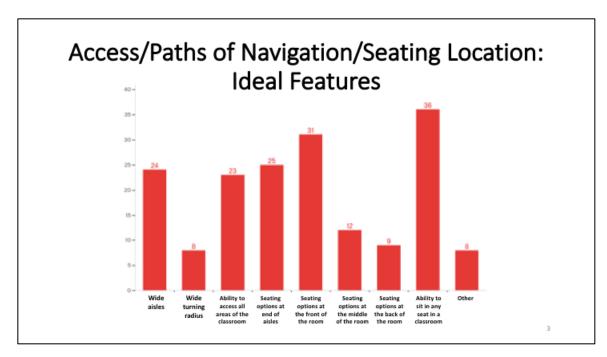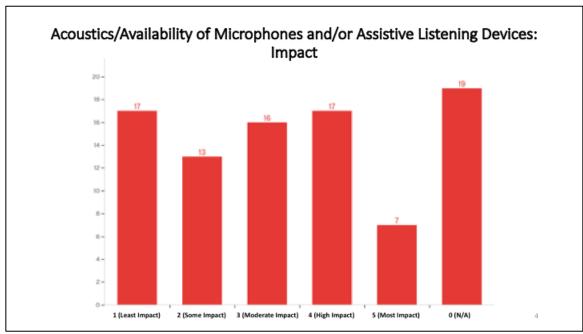
Overview
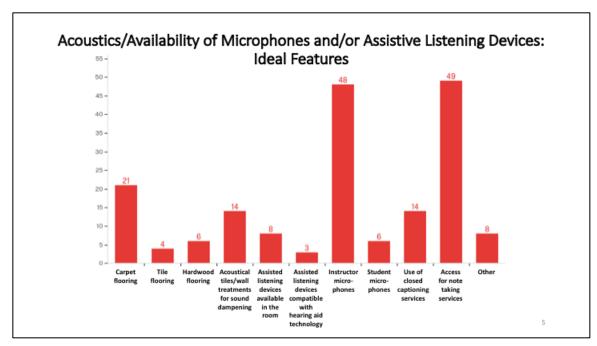
- Total survey responses: n = 115
- Excluded data: n = 26
  - Self-disclosed graduate and professional majors (n = 8)
  - Incomplete surveys (n = 18)

- Total survey responses included for analysis: n = 89

1

Access/Paths of Navigation/Seating Location: Impact

2

Access/Paths of Navigation/Seating Location: Ideal Features

Acoustics/Availability of Microphones and/or Assistive Listening Devices: Impact

Acoustics/Availability of Microphones and/or Assistive Listening Devices: Ideal Features

Furniture: Impact

Furniture: Ideal Features

Lighting: Impact

Lighting: Ideal Features

- Bright fluorescent: 12
- LED lighting: 23
- Dimmable: 40
- Natural lighting from windows: 54
- Shades in rooms to partially block natural lighting: 18
- Blackout shades in rooms to fully block out natural lighting: (0)
- Other: 5

9

Lines of sight/Ability to see instructor, classmates, or projected/whiteboard content: Impact

- 1 (Least Impact): 2
- 2 (Some Impact): 11
- 3 (Moderate Impact): 26
- 4 (High Impact): 27
- 5 (Most Impact): 15
- 0 (N/A): 8

10

Lines of sight/Ability to see instructor, classmates, or projected/whiteboard content: Ideal Features

Temperature: Impact

APPENDIX N

Focus Group Presentation and Protocol

The following content was presented in a PowerPoint presentation for the study's two

Focus Group sessions. The first four slides provided contextual information, and the

remaining slides served as the focus group session's discussion protocol.

Rethinking Classroom Design

Beth Woods

Dr. Janette Hill, College of Education

Follow-up Focus Group Logistics

- **Purpose:** To review survey results, collect feedback on how classroom design features impact your learning, and discuss changes to classroom design features that might better support your learning
- **Duration:** 1 hour
- **Data:** Notes and audio will be recorded during the focus group session
- **Confidentiality:**
  - I am committed to creating a safe climate for discussion and maintaining confidentiality
  - I ask that focus group participants respect the confidentiality of others by not revealing who participated or what was said
- **Accommodations:** Materials will be projected and print versions provided. If you have accommodation needs, please let me know.

1

Questions:
•Are there any questions before we begin?

Overview of the Study

- The study is guided by three research questions:

  1. To what extent do students believe the design of a classroom space impacts learning experiences?

  2. What classroom design features do students identify as impacting their learning experiences?

  3. How do these identified classroom design features impact students' perceptions of their learning experiences?

2

Survey addressed questions # 1 & # 2. This focus group addresses question # 3.

Survey Structure

1. **Informed Consent** - required
2. **Participant Demographics** - captured participant demographics that may be relevant to the study's results and/or to future research
3. **Classroom Design Features that Impact/Support Your Learning** – participants identified classroom design features that impact their learning and quantified their impact, ranking them from least to most impact. Participants were then asked to indicate features that would support their learning.
4. **Open Ended Questions** – participants were asked to identify features that might not be captured by the survey questions and provide additional feedback relevant to the survey.

Refer participants to survey results

Classroom Design Features with the Most Impact

Classroom Design Feature	Mean Response	Impact
Lines of Sight	3.20	Moderate
Temperature	2.73	Some – Moderate
Furniture	2.57	Some – Moderate
Lighting	2.38	Some
Access	2.27	Some
Acoustics	2.18	Some

Question: How relevant are these features to your learning?

Ideal Classroom Design Features

Category	Feature	Count
Lighting	Natural lighting	54
Line of Sight	View content from seat	51
Acoustics	Access for note taking	49
Acoustics	Instructor microphones	48
Temperature	70-74 degrees	46
Line of Sight	Instructor at front of room	45
Lighting	Dimmable lights	40
Furniture	Desks and chairs (separate)	39
Line of Sight	Using technology	38
Temperature	65-69 degrees	38
Access	Sit in any seat	36
Furniture	Tables and chairs	35
Access	Seats at front of room	31

Questions:
- **How do these features impact your learning?**
- **What are the most important classroom design features for your learning? Why?**
- **Can you tell me a story or provide an example of how your learning was impacted?**

Classroom Examples

Lecture Hall   **Tables & Chairs**   **Desks**

Question: Here are pictures of three typical classrooms on campus. What types of classrooms do you find facilitate your learning?

Lecture Hall Classrooms

Lecture Hall

Question: For a large lecture classroom, what are the ideal design features for your learning?

Classrooms with Tables & Chairs

Tables & Chairs

Question: For classrooms with tables, what are the ideal design features for your learning?

Classrooms with Desks

Desks

9

Question: For classrooms with desks, what are the ideal design features for your learning?

SCALE-UP/Active Learning Classroom

10

Here is an example of a SCALE-UP or Active Learning classroom.

Questions:
- **Does this type of classroom facilitate your learning?**
- **For active learning classrooms, what are the ideal design features for your learning?**

Open Ended Feedback

What else would you like to tell me about how classroom design impacts your learning?

11

Questions:
- **What is your favorite/least favorite classroom on campus?**
- **What else would you like to tell me about how classroom design impacts your learning?**

APPENDIX O

Codebook

The following document is the list of codes used for qualitative data analysis in

ATLAS.ti. Each code is listed in alphabetical order along with its respective comment,

which defines the intended use of the code during analysis.

ATLAS.ti Report

Codes grouped by Code groups

◈ Classroom Design Features

18 Codes:

● Feature: Accessible Seating Location

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 12/26/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about the location of the designated accessible seating location in a classroom

○ Feature: Acoustics

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion related to acoustics in classrooms

○ Feature: Aisles

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about aisle space in classrooms

○ **Feature: Door/Exit**

Created: 12/26/18 by Elizabeth Rodgers Woods, **Modified:** 12/26/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about doors or exits in classrooms

○ **Feature: Elevator**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about elevator access to classrooms

● **Feature: Furniture**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 12/26/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about classroom furniture

○ **Feature: Handicap Parking**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about handicap parking

○ **Feature: Inaccessible Classrooms**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about inaccessible classrooms

○ **Feature: Lighting**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about lighting in classrooms

○ **Feature: Line of Sight**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about line of sight in classrooms

○ **Feature: New Construction**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about new construction of classroom spaces

○ **Feature: Paint Color**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about paint color

● **Feature: Personal Space/Overcrowding**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 12/26/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about personal space and overcrowding in classrooms

○ **Feature: Ramp**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about ramps in classrooms

○ **Feature: Renovation Needs**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about renovation needs in classrooms

● **Feature: Technology**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 12/27/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about technology use in classrooms by both faculty and students

○ **Feature: Temperature**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about temperature in classrooms

○ **Feature: White Board**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about white boards in classrooms

 Furniture Sub-Group
8 Codes:

○ **Feature: Furniture - Chair**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth

Rodgers Woods

Comment:

Paragraphs where the words "chair" or "chairs" are used.

○ **Feature: Furniture - Comfort**

Created: 12/26/18 by Elizabeth Rodgers Woods, **Modified:** 12/26/18 by Elizabeth

Rodgers Woods

○ **Feature: Furniture - Desk**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth

Rodgers Woods

Comment:

Paragraphs where the words "desk" or "desks" are used.

○ **Feature: Furniture - Negative Experience**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth

Rodgers Woods

Comment:

Examples of negative experiences with furniture

○ **Feature: Furniture - Positive Experience**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth Rodgers Woods

Comment:

Examples of positive experiences with furniture

○ **Feature: Furniture - Size**

Created: 12/26/18 by Elizabeth Rodgers Woods, **Modified:** 12/26/18 by Elizabeth Rodgers Woods

○ **Feature: Furniture - Stadium-Style**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth Rodgers Woods

Comment:

Paragraphs where the word "stadium-style" is used to describe classroom furniture

○ **Feature: Furniture - Table**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth Rodgers Woods

Comment:

Paragraphs where the words "table" or "tables" are used

◈ **Impact**
8 Codes:

○ **Impact: Adapt**

Created: 12/28/18 by Elizabeth Rodgers Woods, **Modified:** 12/28/18 by Elizabeth Rodgers Woods

○ **Impact: Benefits All Users**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about classroom design features that benefit all users

○ **Impact: Devaluation of DRC Students**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Perceptions about the devaluation of students served by DRC

○ **Impact: Independence**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about students perceived and/or desired level of independence

○ **Impact: Other**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/24/18 by Elizabeth

Rodgers Woods

Comment:

Discussion or examples that didn't fit any category

○ **Impact: Relative to Individual**

Created: 10/21/18 by Elizabeth Rodgers Woods, **Modified:** 10/21/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about impact being relative to the individual

○ **Impact: Stories**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Stories told by participants about the impact of specific classroom design features on

them and their learning

○ **Impact: Unwanted Attention**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about unwanted attention from students or faculty in classrooms

⬦ **Institututional Infrastructure**
4 Codes:

○ **Infrastructure: Bureaucracy**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Perceptions about bureacratic barriers

○ **Infrastructure: Education/Training Gap**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussions about perceived gaps in knowledge, understanding, and/or training

○ **Infrastructure: Favorite Classrooms**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Perceptions about participants' favorite classrooms

○ **Infrastructure: Least Favorite Classrooms**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Perceptions about participants' least favorite classrooms

≪ **Instructional Use**
2 Codes:

○ **Use: Group Work**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about teaching and learning practices related to group work

● **Use: Lecture**

Created: 10/18/18 by Elizabeth Rodgers Woods, **Modified:** 12/26/18 by Elizabeth

Rodgers Woods

Comment:

Discussion about teaching and learning practices related to lecture

≪ **Participants**
13 Codes:

○ **Participant: Anika**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers

Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Ava**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Bailey**

Created: 12/25/18 by Elizabeth Rodgers Woods, **Modified:** 12/25/18 by Elizabeth Rodgers Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Emma**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Grace**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Jane**

Created: 12/25/18 by Elizabeth Rodgers Woods, **Modified:** 12/25/18 by Elizabeth Rodgers Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Jennifer**

Created: 12/25/18 by Elizabeth Rodgers Woods, **Modified:** 12/25/18 by Elizabeth

Rodgers Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Mason**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers

Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Mia**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers

Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Olivia**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers

Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Sarah**

Created: 12/25/18 by Elizabeth Rodgers Woods, **Modified:** 12/25/18 by Elizabeth

Rodgers Woods

Comment:

Used to count the number of times this participant spoke during the focus group

○ **Participant: Several**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers

Woods

Comment:

Used to count the number of times multiple participants spoke simultaneously during the

focus group

○ **Participant: Zoey**

Created: 10/9/18 by Elizabeth Rodgers Woods, **Modified:** 10/9/18 by Elizabeth Rodgers

Woods

Comment:

Used to count the number of times this participant spoke during the focus group

No code group

1 Codes:

○ **Disability Type**

Created: 10/17/18 by Elizabeth Rodgers Woods, **Modified:** 10/18/18 by Elizabeth

Rodgers Woods

Comment:

Used to count the number of times participants self-disclosed disabilities and identify

what disability categories were accounted for during the focus group session

APPENDIX P

Example of Researcher Memo

The following is an example of the types of notes that were maintained throughout the

data collection and analysis of the study. This memo was created prior to and completed

following the preliminary focus group during the pilot study.

Preparation

- Note taker - Amy Ingalls
- Equipment - laptop (recording), digital audio recorder, notability on iPad
- Handouts - Presentation, Protocol, Consent form (no signature), and Survey

Participants: anticipate 4

Time: 12:30 - 1:30 p.m.
Location: Disability Resource Center, Conference Room

Follow-up

Participants: 5

Representation of self-identified disabilities included the following:

Deaf/hard of hearing
Mobility
Visual Impairment/blindness
ADHD
Other (Blood pooling issue)

Technology:

Projected onto flat screen monitor
Recording using digital audio recorder, Notability for iPad application, and partial
recording on QuickTime on laptop

Note taking: Amy Ingalls (Office 365, MS Word) - see imported document 1 2018-03-27

Preliminary Focus Group.docx in ATLAS.ti.

Requested changes:

- Demographics: Review disability categories to be more direct (less overarching categories) — resolution: use categories provided by Erin Benson
- Structure: Revise structure to list one likert scale category and list "select all" options related to that category below (eliminating the release criteria). This allows students to understand more of what the question is asking about and determine an appropriate likert scale option. — resolution: completed in Qualtrics
- Structure: Suggested revising one category question per page and display progress bar — resolution: completed in Qualtrics
- Access: include more options related to universal design/access and around designated seating location — resolution: added "Ability to access all areas of the classroom" and "Ability to sit in any seat in classroom" options in Qualtrics
- Acoustics: include closed captioning and note taking services — resolution: added "Use of closed captioning services" and "Access for note taking services" options in Qualtrics
- Furniture: no change requests
- Lighting: raised concerns about windows/glare, blinds — resolution: added "Natural lighting from windows," "Shades in rooms to partially block natural lighting," and "Blackout shades in rooms to fully block out natural lighting" as options in Qualtrics
- Line of sight: raised concerns about angle of classroom, faculty accessing whiteboards behind students, faculty facing away from students (can't see/hear), furniture doesn't facilitate movement, not using technology that would assist — resolution: added "Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor)," "Using the technology in the room to facilitate class activities (e.g., presentation system, document camera, interactive tablet/touch screen for annotations, etc.)," and "Incorporating student furniture that facilitates movement (e.g., adjustable chairs, chairs that swivel, chairs on casters, etc.)" as options in Qualtrics
- Temperature: requested descriptions in addition to numeric values for temperature — resolution: added "Feels like air conditioner is on full blast in summer, or the heat is turned off in winter," "Feels like the air conditioner is cold, but not blowing at full blast in summer, or the heat is turned on to low in winter," "Feels like the air conditioner is cool in the summer, or the heat is turned to warm in the winter," and "Feels like the air conditioner is turned off in summer, or the heat is on full blast in winter" to each temperature range in Qualtrics.
- Open-ended: no change requests
- Volunteering for Follow-up Focus Groups: Recommended using a Doodle Poll to schedule dates — resolution: completed in Doodle and added to Qualtrics
- Other items: Wanted to address things that weren't structural in the survey — resolution: encouraged use of open-ended space

Modifications completed to survey on March 31, 2018, and completed some end user testing for functionality/clarity before distribution on Monday, April 2, 2018.

Reflection:

Everything ran pretty smoothly
Print materials worked well
PowerPoint slides helped with facilitated discussion
Ensure all recording devices are working before you get going!!!
Ended on time - good pacing
Kept discussion on track

APPENDIX Q

Survey Participants' Self-Reported Majors

The following is the list of survey participants' self-reported majors, sorted highest to lowest by frequency count (*n*) with the percentage of the survey population listed for each major.

Major	Count	%
Communication Studies	5	5.38%
Human Development and Family Sciences	5	5.38%
Computer Science	4	4.30%
International Affairs	4	4.30%
Psychology	4	4.30%
Advertising	3	3.23%
Biological Science	3	3.23%
Marketing	3	3.23%
Agricultural Communication	2	2.15%
Biology	2	2.15%
Early Childhood Education	2	2.15%
Exercise and Sport Science	2	2.15%
Film Studies	2	2.15%
Fisheries and Wildlife	2	2.15%
Genetics	2	2.15%
Pharmacy	2	2.15%
Public Relations	2	2.15%
Real Estate	2	2.15%
Social Work	2	2.15%
Spanish	2	2.15%
Sport Management	2	2.15%
Agriscience and Environmental Systems	1	1.08%
Animal Health	1	1.08%
Animal Science	1	1.08%
Anthropology	1	1.08%
Art Education	1	1.08%
Biochemical Engineering	1	1.08%
Biological Engineering	1	1.08%
Business	1	1.08%
Chemistry	1	1.08%
Cognitive Science	1	1.08%
Communication Sciences and Disorders	1	1.08%
Computer Systems Engineering	1	1.08%
Consumer Journalism	1	1.08%
Criminal Justice	1	1.08%
Dietetics	1	1.08%
Ecology	1	1.08%
Engineering	1	1.08%
English	1	1.08%
Environmental Health Science	1	1.08%
Finance	1	1.08%
Finance/International Business	1	1.08%
Health Promotion	1	1.08%
History	1	1.08%
Journalism	1	1.08%
Landscape Architecture	1	1.08%
Marketing/International Business	1	1.08%
Mathematics Education	1	1.08%
Mechanical Engineering	1	1.08%
Middle Grades Education	1	1.08%
Music Performance	1	1.08%
Music Therapy	1	1.08%
Natural Resource Recreation and Tourism	1	1.08%
Political Science	1	1.08%
Public Health	1	1.08%
Religion	1	1.08%
World Language Education	1	1.08%
Total	**93**	**100.00%**

APPENDIX R

Survey Participants' Self-Reported Disabilities

The following is the list of survey participants' self-reported disabilities, sorted by highest to lowest frequency count (*n*) with percentage of the survey population listed for each disability.

Disability	Count	%
ADHD	38	23.03%
Anxiety Disorder	27	16.36%
Depression	18	10.91%
Learning Disabilities	12	7.27%
Hearing Impairment/Deaf	7	4.24%
Traumatic Brain Injury	7	4.24%
Obsessive Compulsive Disorder	6	3.64%
Autism Spectrum Disorders	4	2.42%
Other: Diabetes (Type 1)	4	2.42%
Bipolar Disorder	3	1.82%
Other: Dyslexia	3	1.82%
Post-Traumatic Stress Disorder	3	1.82%
Cancer	2	1.21%
Other: Ehlers Danlos Syndrome	2	1.21%
Lupus	2	1.21%
Mobility Impairment	2	1.21%
Other: Postural Orthostatic Tachycardia Syndrome	2	1.21%
Rheumatoid Arthritis	2	1.21%
Visual	2	1.21%
Other: Anxiety Symptoms	1	0.61%
Other: Autoimmune Disease	1	0.61%
Other: Celiac Disease	1	0.61%
Other: Conversion Disorder	1	0.61%
Cystic Fibrosis	1	0.61%
Other: Diabetes (undefined)	1	0.61%
Epilepsy	1	0.61%
Other: Fibromyalgia	1	0.61%
Other: Gastroparesis	1	0.61%
Heart Disease	1	0.61%
Other: Hypertension	1	0.61%
Other: Klinefelters	1	0.61%
Leukemia	1	0.61%
Other: Lyme disease	1	0.61%
Narcolepsy	1	0.61%
Other: Osteoarthritis	1	0.61%
Tourette Syndrome	1	0.61%
Other: Sjögren's syndrome	1	0.61%
Prefer not to answer	1	0.61%
Cerebral Palsy	0	0.00%
Crohn's Disease	0	0.00%
Lymphoma	0	0.00%
Multiple Sclerosis	0	0.00%
Muscular Dystrophy	0	0.00%
Paraplegia	0	0.00%
Total	165	100%

APPENDIX S

Features that Support Learning by Category

The following is the list of classroom design features survey participants identified as supporting their learning. Each feature is organized by category and sorted by highest to lowest frequency count (*n*) with percentage of the survey population listed for each disability.

Category	Response	Count	%
Access	Ability to sit in any seat in a classroom	36	20.45%
Access	Seating options at the front of the room	31	17.61%
Access	Seating options at end of aisles	25	14.20%
Access	Wide aisles	24	13.64%
Access	Ability to access all areas of the classroom	23	13.07%
Access	Seating options at the middle of the room	12	6.82%
Access	Seating options at the back of the room	9	5.11%
Access	Wide turning radius	8	4.55%
Access	Other: Seating type (e.g., comfortable seats, left handed desks, bigger desks, table space, elbow room)	4	2.27%
Access	Other: Seating arrangement (e.g., open classroom, sitting in a circle, ability to sit with back to wall)	2	1.14%
Access	Other: N/A	2	1.14%
	Total	176	100.00%

Category	Response	Count	%
Acoustics	Access for note taking services	49	27.07%
Acoustics	Instructor microphones	48	26.52%
Acoustics	Carpet flooring	21	11.60%
Acoustics	Acoustical tiles/wall treatments for sound dampening	14	7.73%
Acoustics	Use of closed captioning services	14	7.73%
Acoustics	Assisted listening devices available in the room	8	4.42%
Acoustics	Hardwood flooring	6	3.31%
Acoustics	Student microphones	6	3.31%
Acoustics	Tile flooring	4	2.21%
Acoustics	Other: N/A	4	2.21%
Acoustics	Assisted listening devices compatible with hearing aid technology	3	1.66%
Acoustics	Other: Qualified notetakers	1	0.55%
Acoustics	Other: Student microphones	1	0.55%
Acoustics	Other: Instructors using microphones	1	0.55%
Acoustics	Other: Ability to see the instructor if closed captioning/text is not available	1	0.55%
	Total	181	100.00%

Category	Response	Count	%
Furniture	Individual desks and chairs, mobile (e.g., small lecture classrooms)	39	27.27%
Furniture	Table seating and chairs (e.g., seminar classroom)	35	24.48%
Furniture	Individual desks with chairs attached, mobile (e.g., small lecture classrooms)	24	16.78%
Furniture	Stadium style seating (e.g., lecture hall)	21	14.69%
Furniture	Individual desks, fixed to the floor (e.g., small lecture classrooms)	16	11.19%
Furniture	Other: Seating types (i.e., larger desks, standing desks, comfortable seats, accessible for wheelchairs/mobility issues)	4	2.80%
Furniture	Other: Seating arrangement (e.g., square table setup with instructor at one end, end of aisle, back to wall, no doors behind)	2	1.40%
Furniture	Other: Low background noise/highly amplified professor's voice	1	0.70%
Furniture	Other: N/A	1	0.70%
	Total	143	100.00%

Category	Response	Count	%
Lighting	Natural lighting from windows	54	35.53%
Lighting	Dimmable	40	26.32%
Lighting	LED lighting	23	15.13%
Lighting	Shades in rooms to partially block natural lighting	18	11.84%
Lighting	Bright fluorescent	12	7.89%
Lighting	Other: N/A	3	1.97%
Lighting	Other: Natural lighting (consideration for projection needs)	2	1.32%
Lighting	Blackout shades in rooms to fully block out natural lighting	0	0.00%
	Total	152	100.00%

Category	Response	Count	%
Lines of Sight	Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor)	51	27.42%
Lines of Sight	Instructor at the front of the room with projection on either side of the instructor podium (e.g., lecture hall)	45	24.19%
Lines of Sight	Using the technology in the room to facilitate class activities (e.g., presentation system, document camera, interactive tablet/touch screen for annotations, etc.)	38	20.43%
Lines of Sight	Incorporating student furniture that facilitates movement (e.g., adjustable chairs, chairs that swivel, chairs on casters, etc.)	29	15.59%
Lines of Sight	Instructor in the center of the room with projection/monitors distributed around the room (e.g., SCALE-UP or active learning classroom)	17	9.14%
Lines of Sight	Other: N/A	2	1.08%
Lines of Sight	Other: Space for multiple materials/Ability to see complex math notation	1	0.54%
Lines of Sight	Other: Anything is fine (must be able to see)	1	0.54%
Lines of Sight	Other: Ability to see instructor's mouth	1	0.54%
Lines of Sight	Other: Low lights make people sleepy	1	0.54%
	Total	186	100.00%

Category	Response	Count	%
Temperature	70-74 degrees Fahrenheit (feels like the air conditioner is cool in the summer, or the heat is turned on to warm in the winter)	46	50.00%
Temperature	65-69 degrees Fahrenheit (feels like the air conditioner is cold, but not blowing at full blast in the summer, or the heat is turned on to low in winter)	38	41.30%
Temperature	60-64 degrees Fahrenheit (feels like the air conditioner is on full blast in summer, or the heat is turned off in winter)	4	4.35%
Temperature	75-79 degrees Fahrenheit (feels like the air conditioner is turned off in summer, or the heat is on full blast in winter)	3	3.26%
Temperature	Other: N/A	1	1.09%
	Total	92	100.00%

APPENDIX T

All Features that Support Learning

The following is the list of classroom design features survey participants identified as supporting their learning across all categories. Features are sorted by highest to lowest frequency count (*n*) with percentage of the survey population listed for each disability.

Category	Response	Count	%	
Lighting	Natural lighting from windows	54	5.81%	
Lines of Sight	Ability to view projected content and/or whiteboard at your seat (e.g., printed slides, on a personal device, or on a monitor)	51	5.48%	
Acoustics	Access for note taking services	49	5.27%	
Acoustics	Instructor microphones	48	5.16%	
Temperature	70-74 degrees Fahrenheit (feels like the air conditioner is cool in the summer, or the heat is turned on to warm in the winter)	46	4.95%	
Lines of Sight	Instructor at the front of the room with projection on either side of the instructor podium (e.g., lecture hall)	45	4.84%	
Lighting	Dimmable	40	4.30%	
Furniture	Individual desks and chairs, mobile (e.g., small lecture classrooms)	39	4.19%	
Lines of Sight	Using the technology in the room to facilitate class activities (e.g., presentation system, document camera, interactive tablet/touch screen for annotations, etc.)	38	4.09%	
Temperature	65-69 degrees Fahrenheit (feels like the air conditioner is cold, but not blowing at full blast in the summer, or the heat is turned on to low in winter)	38	4.09%	
Access	Ability to sit in any seat in a classroom	36	3.87%	
Furniture	Table seating and chairs (e.g., seminar classroom)	35	3.76%	
Access	Seating options at the front of the room	31	3.33%	Presented to focus group
Lines of Sight	Incorporating student furniture that facilitates movement (e.g., adjustable chairs, chairs that swivel, chairs on casters, etc.)	29	3.12%	
Access	Seating options at end of aisles	25	2.69%	
Access	Wide aisles	24	2.58%	
Furniture	Individual desks with chairs attached, mobile (e.g., small lecture classrooms)	24	2.58%	
Access	Ability to access all areas of the classroom	23	2.47%	
Lighting	LED lighting	23	2.47%	
Acoustics	Carpet flooring	21	2.26%	
Furniture	Stadium style seating (e.g., lecture hall)	21	2.26%	
Lighting	Shades in rooms to partially block natural lighting	18	1.94%	Top 50%
Lines of Sight	Instructor in the center of the room with projection/monitors distributed around the room (e.g., SCALE-UP or active learning classroom)	17	1.83%	
Furniture	Individual desks, fixed to the floor (e.g., small lecture classrooms)	16	1.72%	
Acoustics	Acoustical tiles/wall treatments for sound dampening	14	1.51%	
Acoustics	Use of closed captioning services	14	1.51%	
Access	Seating options at the middle of the room	12	1.29%	
Lighting	Bright fluorescent	12	1.29%	
Access	Seating options at the back of the room	9	0.97%	
Access	Wide turning radius	8	0.86%	
Acoustics	Assisted listening devices available in the room	8	0.86%	
Acoustics	Hardwood flooring	6	0.65%	
Acoustics	Student microphones	6	0.65%	
Access	Other: Seating type (e.g., comfortable seats, left handed desks, bigger desks, table space, elbow room)	4	0.43%	
Acoustics	Tile flooring	4	0.43%	
Acoustics	Other: N/A	4	0.43%	
Furniture	Other: Seating types (i.e., larger desks, standing desks, comfortable seats, accessible for wheelchairs/mobility issues)	4	0.43%	
Temperature	60-64 degrees Fahrenheit (feels like the air conditioner is on full blast in summer, or the heat is turned off in winter)	4	0.43%	
Acoustics	Assisted listening devices compatible with hearing aid technology	3	0.32%	
Lighting	Other: N/A	3	0.32%	
Temperature	75-79 degrees Fahrenheit (feels like the air conditioner is turned off in summer, or the heat is on full blast in winter)	3	0.32%	
Access	Other: Seating arrangement (e.g., open classroom, sitting in a circle, ability to sit with back to wall)	2	0.22%	
Access	Other: N/A	2	0.22%	
Furniture	Other: Seating arrangement (e.g., square table setup with instructor at one end, end of aisle, back to wall, no doors behind)	2	0.22%	
Lighting	Other: Natural lighting (consideration for projection needs)	2	0.22%	
Lines of Sight	Other: N/A	2	0.22%	
Acoustics	Other: Qualified notetakers	1	0.11%	
Acoustics	Other: Student microphones	1	0.11%	
Acoustics	Other: Instructors using microphones	1	0.11%	
Acoustics	Other: Ability to see the instructor if closed captioning/text is not available	1	0.11%	
Furniture	Other: Low background noise/highly amplified professor's voice	1	0.11%	
Furniture	Other: N/A	1	0.11%	
Lines of Sight	Other: Space for multiple materials/Ability to see complex math notation	1	0.11%	
Lines of Sight	Other: Anything is fine (must be able to see)	1	0.11%	
Lines of Sight	Other: Ability to see instructor's mouth	1	0.11%	
Lines of Sight	Other: Low lights make people sleepy	1	0.11%	
Temperature	Other: N/A	1	0.11%	
Lighting	Blackout shades in rooms to fully block out natural lighting	0	0.00%	
	Total	930	100.00%	