City Space
Architecture

Inclusive Rural Spaces in Architecture Education

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Abstract
Pedagogies of building systems in architectural education are traditionally framed as the technical knowledge guiding construction, material applications, structures, and mechanical building services. This paper provides a framework and a case study for centring inclusive and universal design principles in the teaching of building systems with a focus on designing public spaces for rural and aging populations. It proposes methods for integrating design accountability, sustainable environmental practices, and cultural contexts into architectural design and education.
Public spaces, services, and resources are spread thinly outside of cities and denser communities, creating barriers to access for aging populations among others. This pedagogical framework for inclusive rural architecture focuses on post offices as one of the few public institutions in rural communities and a vital conduit to essential services (particularly during health crises). In the speculative space of architecture curriculum, students conceived of additional services and programs to rethink the role of post offices in communities. These programs targeted accessibility barriers by providing digital resource centres, transportation hubs, and community gathering spaces.
The flexibility, adaptability, and comfort at the core of universal design principles provide a lens for understanding sustainable environmental techniques. Adaptable buildings constructed with replaceable and reusable parts allow for repair and resiliency over time. Material and structural systems designed for intuitive use and presentation of information promote accessible communication. Passive systems design enables comfort in dialog with the environment and a reduction in required energy. However as passive systems often require building operability, inclusive design principles call for building systems to be operable by diverse users. Post office projects in this case study integrated universal design principles to achieve energy efficient buildings that respond to changing climates and rural cultural contexts.
Replacing minimum standards for accessibility within curricula with inclusive design criteria is also enacted through methodologies. While educational institutions are clustered in urban areas, many students come from or have ties to rural communities. The focus on rural public spaces and aging populations is a means for students to bring their own diverse backgrounds, places of origin, and histories into their academic studies. In combining methods of engaged research with a universal design-focused pedagogy for building systems, students expand technical knowledge of architectural design with the objective of creating equitable and inclusive public spaces.

Keywords: architectural education, universal design, building systems, rural design, climate change

1. Introduction

Systems of inclusion and universal design are rarely foregrounded in the teaching of building technologies and are often siloed into areas of 'social' concerns. The integration of universal design principles into architectural building systems courses provides methods to rethink the social construction of technical knowledge that underpins both building systems and inclusive design models. Centring inclusion for populations such as the aging in building system pedagogies can also work to bring issues of environmental and social justice into the foreground of systems design, moving beyond accessibility regulation. The case study in architecture education presented here advocates for incorporating inclusive design in technical courses through design projects for post offices—a vital conduit for essential services and resources and one of the few institutional public spaces in rural areas. Projects for universally designed rural post offices serve as prototypes for integrating design accountability, sustainable environmental practices, and cultural contexts into public buildings and architecture pedagogies.

1.1 Shifting Building Systems Pedagogy

Building systems courses, also known as systems integration, integrated building systems, and related titles, hold a particular place in professional architecture curricula. They are traditionally framed as the locus for bringing together technical knowledge guiding construction, material applications, structures, and environmental building components. The focus on integration as a building design discipline arose from the sudden injection and advancement of technical systems following World War II (Bachman, 2003), although the common basis for studying the corollary attributes of material assemblies' dates back to at least the 19th century (Breymann, 1890). More recently, in the United States, building systems courses share content and learning objectives with 'comprehensive studios' where building technologies, sustainability, and environmental systems are integrated into design pedagogy, a process that the National Architectural Accrediting Board considers one of the "hallmarks of architecture education" (NAAB, 2020). The movement toward 'integrated' and 'comprehensive' approaches to architecture education can also be seen as a response to the limitations of specialized fragmented disciplines that expanded in the latter half of the twentieth century (Chandler and Vassigh, 2011).

1.2 Building Systems and Climate Change

In recent decades, heightened awareness and response to environmental degradation and emerging theories of technology advanced as major themes in technical courses. As buildings have become increasing consumers of energy and the largest source of greenhouse gas emissions that cause climate change (PEW, 2006), sustainability has risen as a primary focus of knowledge production and pedagogical objective in teaching building systems. The prevalence of sustainability goals in design education has been well documented, even if environmental performance continues to be isolated from other core design concepts, persistently discredited, and more curricular infusion is needed to train future generations of designers to mitigate the effects of climate change (Altomonte, Rutherford, and Wilson, 2014; Santini, 2020; Leskovar, 2020). Reliance in building systems pedagogy on technological design solutions to environmental

degradation over cultural factors also poses challenges. Contemporary environmental technologies often involve the application of additional energy (Braham, 2012).

One means of overcoming this binary between technological and cultural solutions is by teaching the mutual implication of the two. Theories of technology that offer critical perspectives on the relationship between technological objects, societies, and culture further integrate building systems into other areas of architecture education and practice. Actor-network theory (ANT), for example, positions technics, objects, and social relations as an inseparable network of relations or chain of associations between humans and non-humans (Latour, 1991; Akrich, 1992). When architects design building systems "they simultaneously build systemic relations among networks of cultural, economic, ecological, and even political systems" (Moe and Smith, 2012). Frequently drawing on the field of science and technology studies, these and similar frameworks suggest ways to remove building systems from technocratic determinism and study and conceive of building technologies as a network of relations connected to other forms of architectural, design, and social inquiry.

1.3 Universal Design in Pedagogy

Teaching universal design principles in building systems education helps rethink our approach to conventional ideologies, categories, and pedagogies of building technology. By forefronting universal design, we can explore ways for combining technical aspects of architectural design with culturally-contingent, health-centered, and socially just perspectives. There are a range of documented strategies for injecting universal design into architecture curriculum including stand-alone lessons, discrete courses, one-time events, studio or elective infusion, and infusion into the entire curriculum (Welch and Jones, 2001; Harrison, Busby, and Horgan, 2015; Szewczenko and Widzisz-Pronobis, 2020). Integration methods similarly range from re-examining canonical precedents (Asmervik, 2009), to empathetic exercises (Battarbee and Koskinen, 2005), partnership with clients for engaged studios (Terry, 2008), and user needs research. While there has been some shift in architecture schools from designing for people with special needs to inclusive design for a diverse population, it has not always been clear to educators that universal design is fundamentally different from accessibility outlined by the Americans with Disabilities Act (ADA) and building codes (Welch and Jones, 2001). A 2015 survey of architecture schools in the United States found that 69% of responding schools indicated that their curricula addressed universal design, although some confusion with accessibility may remain (Basnak, Tauke, and Weidemann, 2015). This section presents an initial framework for linking building technology education and universal design generally, while findings and observations will be discussed following in the course case study.

Universal design provides a framework for 'integration' methodologies in building systems. Universal design requires a 'joined-up' approach (Harrison, Busby, and Horgan, 2015) which both challenges methods of designing for the minimum of regulatory compliance as well as the isolation of building components as discrete elements. Designing environments to be usable by all people to the greatest extent possible (Mace et al, 1997), necessitates a synthetic approach to building systems. Foregrounding simple and intuitive wayfinding in the early phases of building design, for example, can impact the development of material assemblies and structural systems. While increasing focus on sustainability, less energy-intensive building construction and operation, and passive

systems design, architecture students can use universal design principles to critically examine those systems in relation to principles of equitable use. The lessons of building operability in terms of movement and access can be extended to consider building operability of passive systems like ventilation and daylighting. The introduction of automated and 'smart' passive systems can be measured beyond metrics of efficiency, extending to how they enable a wider range of people to participate in the activation of sustainable buildings. Inclusive design methods make clear how the technics of environmental and spatial control articulate social values and design ethics.

1.4 Building Systems for Social Justice

Building systems are a critical component of social and environmental justice. In order to strengthen this position in architecture education, we have to reveal how technical knowledge is socially and culturally contingent. The discipline of architecture has historically isolated technological issues from broader systems that presuppose building practices (Moe and Smith, 2012). Incorporating the framework of both the seven principles of universal design (Mace et al, 1997) and the eight goals of universal design (Steinfeld and Maisel, 2012) works to counter perspectives of technological autonomy and technological determinism. As the eight goals of universal design expand the inclusion of social participation and "respecting and reinforcing cultural values and the social and environmental context" of design projects (Steinfeld and Maisel, 2012), they promote situating readings in the relationship between technology and society. Extending from theories of technology to design practices, building systems should also be adapted to differences in culture and confront historical injustices. Learning from the shifting definition of disability in the latter half of the 20th century, from a medical perspective that viewed disability in terms of functional limitations to a socio-political view that focuses rather on the disabling qualities of the environment (Hahn, 1988 in Welch, 1995), the implication of building systems in enabling environmental inequities is more readily apparent. This definition is reinforced by the Convention on the Rights of Persons with Disabilities which recognizes "that disability is an evolving concept and that disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others" (CRPD, 2006). With the focus on the integration of environmental components and building construction, building systems are a critical area for examining the environmental factors implicated in evolving conceptual understandings of disability. Building systems that minimize health disparities such as improving indoor air quality and reducing toxic exposure play a further role in bringing environmental justice indoors (Adamkiewicz et al, 2011). While health disparities adversely affecting low-income communities and communities of colour need to be addressed systemically, universal design suggests ways of both advocating for policy change and designing beyond regulations to improve building environments for all people.

1.5 Building Beyond Code

Inclusive design principles such as universal design benefit building systems courses by providing methods for thinking about and dealing with codes and standardization. Building systems courses traditionally serve as the delivery method for learning about legal code including life safety, land use, structure, and the evaluative processes to

ensure building code compliance.[1] Since its inception, universal design has served as a framework for interrogating and moving beyond minimum regulatory codes.[2] While understanding how to design and build 'to code' is important for professional architectural education, it's also crucial to establish frameworks for understanding how these codes come into existence and how to synthesize systems and achieve design objectives catering to all people and diverse constituencies in excess of code. In outlining their definition of sociotechnical codes, Steven Moore and Barbara Wilson look to the disability rights movement and the passage of the ADA in the United States. Sociotechnical codes are "those that self-consciously and simultaneously seek to integrate social equity for specific social groups as a dimension of technological change" by integrating multiple frames of interpretation through action (Moore and Wilson, 2012). While this model of sociotechnical codes focuses on the ADA, a legal regulatory framework, theorizing the codification of social equity via technology can be extended to the advocacy for universal design as constructing multiple frames of interpretation through action for all people rather than specific social groups. Sociotechnical codes provide a framework for thinking of how imaginative design actions overlay to create regulations and how new frameworks can come into being to move beyond compliance. In suggesting methods and techniques for interrogating and moving beyond codes and standards, universal design principles and goals counter the technological drift of building systems and their teaching in design schools.

2. Case Study: Post Offices for Aging and Rural Populations

This case study presents a building systems pedagogy that forefronts inclusive design strategies in public spaces with a focus on rural and aging populations. As the world population grows, the proportion of people 60 years and older continues to increase. In 2019, the number of people aged 60 years and older was one billion and this number is projected to rise to 1.4 billion by 2030 (WHO, 2020). Although the percentage of older persons in urban areas is now growing more rapidly (United Nations, 2015), population aging is a global phenomenon that is first manifested in rural areas (Cromartie, 2020). In the United States, 19 percent of the rural population is 65 years or older, compared with 15 percent in urban areas and rural counties make up nearly 85 percent of the 1,104 "older-age counties" (USDA, 2018). The higher rates of aging persons in rural areas in the U.S. is attributable largely to out-migration of young adults to urban areas as well as net in-migration of older people to attractive rural destinations (Glasgow and Brown, 2012). The rates of income and poverty among older rural populations vary greatly, in-part depending on the cause of demographic change. In our university context, the state of New Mexico, the intersection between aging populations and poverty is more pronounced with a higher-than-average rate of rural population age 65 or over (27.4 percent, see Figure 1) and the highest rate of rural poverty in the United States (22 percent) (U.S. Census Bureau, 2016). Many rural communities lack sufficient capacity to support age-inclusive design in the built environment (Cromartie,

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[1] The most recent NAAB Conditions for Accreditation (NAAB, 2020) only make one reference each to accessibility and inclusion of persons with different abilities.
[2] I'm indebted to Karen King for sharing her perspective on universal design with our class in October 2020, including this point. See also (King, 2005).

 2020). Public spaces, services, and resources are spread thinly in many areas outside of cities and denser communities.
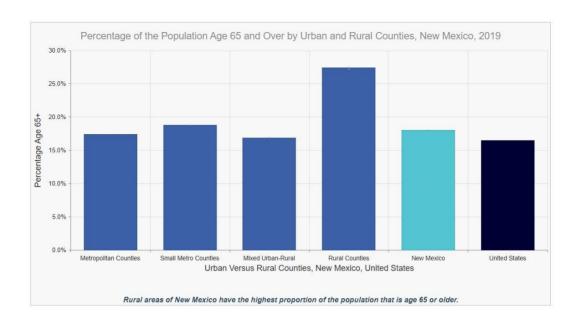

Figure 1. Percentage of the Population Age 65 and Over by Urban and Rural Counties, New Mexico, 2019. (Source: New Mexico's Indicator Based Information System, online: https://ibis.doh.nm.gov/indicator/view/PopDemoAge65.UrbanRur.html).
Alt text: Bar graph showing that in Rural Counties in New Mexico, 27.4% of the population is over the age of 65 compared to 17.4% in Metropolitan Counties.

While forefronting universal design principles to create environments usable by all people to the greatest extent possible, the related field of designing for aging populations (Steinfeld and Maisel, 2012) presents an entry point for students to develop and assess methods of inclusion. Mobility, dexterity, sensory, cognitive, and physical health changes are prevalent in aging populations, eliciting issues about how we consider human-environment interaction (Fedderson, 2009). The current generation of people age 65 and older in the U.S. includes the 'boomer generation,' a generation that played a role in steering movements for social justice including civil rights and disability rights. Learning from this generation can extend from user research to lessons about rights-oriented actions and advocacy. As environments and building systems are increasingly integrated into an information society, access by elderly populations to technology-based services has become a major issue (Mellors, 2009) and profoundly affects how we meet the demands of aging people (Dwight, 2009). This pedagogy considers the critique that exclusive consideration on a growing aging population in design education can narrow the opportunities for illustrating user needs relevant to future design professions who will be designing for a range of populations (Howell, 1977). While experience has demonstrated that meeting the needs of older persons   "frequently generates design solutions which benefit a wider range of user groups" (Morrow, 2002), the design project described here considered aging people one important and often under-considered population within a diversity of people occupying public spaces. However, when considering 'diversity,' it's important to challenge what is considered

legitimate knowledge which involves the specificity of "looking at which and whose stories and experiences have been ignored and why" (Kishimoto, 2018).[3] In our geographical context and course objectives, strategies for considering the needs of aging populations opens up possibilities to rethink design projects for all people.

2.1. The Public Spaces and Services of Post Offices

This pedagogical framework for inclusive rural architecture focuses on post offices as one of the few public institutions in rural communities and a vital conduit to essential services. The post office as a student design project gathers efforts to learn inclusive design strategies around historically underserved communities through existing networks of public spaces. Post offices are "local public anchor institutions"—shared civic buildings, services and spaces accessible to and benefiting all (Heyda, 2020). The social value of postal services extends beyond measurable economic benefits, connecting people, fostering democracy, and functioning as a key part of emergency and national security infrastructure (Morrissey, 2020). The role of the postal service in providing access to resources has been particularly pronounced during the global COVID-19 pandemic. The delivery of essential goods, such as prescription drugs, are a critical lifeline "for seniors and people with disabilities" (Solomon, Baradaran, and Roberts, 2020). Among proposals for expanding services at post offices (which will be discussed in more detail later) is a call to use United States Postal Service (USPS) facilities for provisioning access to COVID-19 testing in the U.S. (Singh et al, 2020). Post offices and postal delivery have also provided access to the democratic process as a record number of people voted by mail in the 2020 U.S. election (Stewart, 2020). Even outside of health crises, "voting by mail can increase access to the ballot box for low-income working parents and others with inflexible schedules, transportation barriers, health issues, and other obstacles to voting in person" (Morrissey, 2020). Voting by mail, and the increased access it provides to democratic processes, particularly for marginalized communities, have positioned postal services as the subject of intense political debate over the past two years.

2.2. Historical Context of Rural Post Offices

In many rural areas, postal services are the only means to obtain essential goods without significant travel. The USPS is the only mail and package delivery system that has a universal obligation to provide service to every delivery point in the U.S., regardless of profit. About 29 percent of all delivery points served by the USPS are classified as rural (USPS, 2019). A recent survey found that the public places a very high level of trust in the USPS (second only to the Centers for Disease Control and Prevention), and that trust was significantly higher in rural communities (Pollard and Davis, 2020). The foundations for rural postal connectivity in part stems from the role of establishing post offices to the colonial project of the U.S. After the Post Office Act of 1792, the U.S. state quickly formed a web connecting the country and "for the vast majority of Americans the postal system was the central government." (John, 1995, cited in Acemoglu, Moscona, and Robinson, 2016). Cameron Blevins describes this

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[3] This perspective on the language of 'diversity' draws on Kishimoto's discussion of racism and the observations within anti-racist pedagogy that "Diversity is about managing race rather than challenging racism."

system as a "gossamer network", an underlying circuitry of western expansion composed of a sprawling and fast-moving web of post offices (Blevins, 2021). While the U.S. waged war against indigenous people and forced them onto reservations, the USPS in part facilitated settler colonialism by connecting the region's far-flung settlements into a national system of communications (Blevins, 2021). The number of post offices in the U.S. peaked in 1901, at 76,945 post offices, before the introduction of rural free delivery as a permanent service in 1902 (USPS, 2021). With rural residences and businesses included as points of delivery, post office locations have steadily and continuously declined over the past century to 26,362 in 2020 (USPS, 2021). Smaller communities in New Mexico have been included in some of the most recent closures. Despite a fight from the community to keep it open, the Tererro, NM post office was closed in 2019 and replaced with mail collection box units (Smarsh, 2020). Other small towns and communities in New Mexico have maintained persistent struggles to keep their post offices open.

2.3. Accessibility in Post Offices

Given their role as a conduit to vital services and goods in rural areas, inclusive designs for post offices can improve quality of life and promote independent living. Aging in place strategies often focus on creating inclusive residential design. Universally designed public spaces can work in tandem to residential improvements in living conditions. Beyond providing access to information and services, small town post offices often function as social hubs (Heyda, 2020). Inclusive post office designs are essential to fulfilling the goals of the Convention on the Rights of Persons with Disabilities in enabling people to live independently and participate fully in all aspects of life, in both rural and urban areas (CRPD, 2006), and promote community sustainability. As a federally funded agency, the national policy governing post office accessibility is the Architectural Barriers Act of 1968 and not the more recent ADA of 1990 (USPS, n.d.). The U.S. Access Board is the independent federal agency mandated to ensure compliance with the ABA in buildings designed, built, or altered with federal funding. In the most recent report, 32 of the 38 cases investigated by the Board under the ABA for all federal buildings concerned access to U.S. Post Offices (U.S. Access Board, 2021). That the majority of investigated and resolved cases concerned access to post offices is "typical of the Board's yearly caseload" (U.S. Access Board, 2021). The predominance of cases involving post offices in part signals the vastness of The USPS and the extent to which post offices are a primary point of contact between people and government spaces. However, it also indicates that post offices require a rethinking in order to remove barriers to access and operation, even in order to meet minimum compliance criteria.

2.4. The Post Office Design Project

The types of buildings occupied by USPS vary widely in many rural areas including those in New Mexico, often depending on the size of area served by mail delivery and the era of construction. Many rural post offices take the form of small manufactured trailers (see Figure 2) with added stairs and ramps built in accordance with the ABA. In rethinking the role of post offices in communities within the speculative space of the architectural curriculum, students conceived of additional services and programs that could capitalize on the existing network of the USPS. These programs targeted

accessibility barriers by providing digital resource centres, local access to essential goods and services, transportation hubs, and community gathering spaces.

Figure 2. Photograph of the post office in Chamisal, NM (by author).
Alt text: A snow-covered manufactured trailer with an entrance accessible via two steps or a ramp.
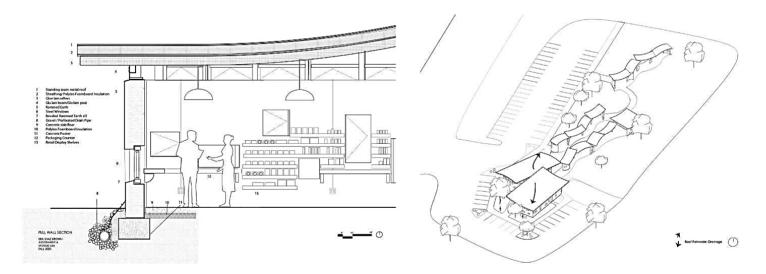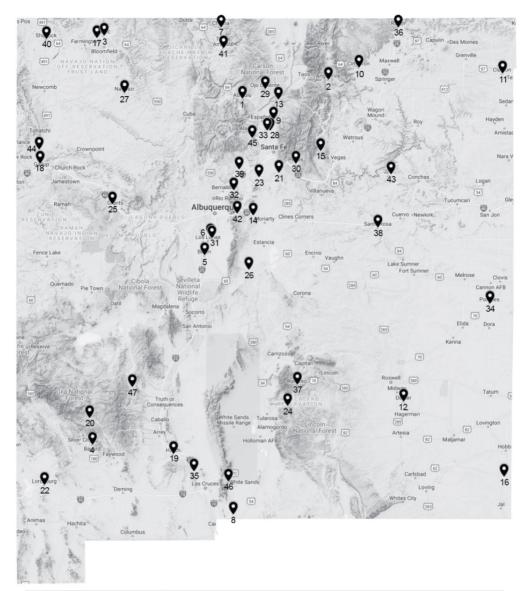

Figure 3. Building section detail (left) and isometric view (right) of post office design project in Abiquiú, NM by Shae Brown, 2020.
Al text: on the left, section drawing showing a one-story building with a market space inside and operable window; in the right: to an isometric drawing showing outdoor shaded public space next to post office.

Over the two years that this course has focused on rural post office projects, students have proposed additional post office uses including food access in food deserts, childcare centres, water and soil testing facilities, educational facilities, land-preservation and conservation centres, maker spaces, transportation hubs, arts centres, credit

unions, libraries, health clinics, and recreational facilities among many others. Given the agricultural nature of many rural post offices, integrating food sources with community-supported agriculture or community-run cafes emerged as a common theme. In one project sited in Abiquiú, NM, a food retail establishment is housed within the post office while pavilions for a farmer's market extend beyond the building, encompassing multiple strategies for increasing food access (see Figure 3).

These imaginative proposals were built on current policy discussions that seek to identify ways to improve The Postal Service's long-term economic viability, respond to institutional and structural marginalization of low-income areas and communities of color, and to provide public spaces and amenities to improve quality of life. These programmatic inventions recognize the importance of imaginary narratives in architecture education (Fournier, 2017) and take positions within the argument that "what the post office really needs is reimagining" (NY Times Editorial Board, 2021). By allowing the USPS to expand banking services, for example, policy makers could remove structural barriers for the quarter of Americans that are currently 'underbanked' (Solomon, Baradaran, and Roberts, 2020) and low-income communities underserved by financial institutions (Morrissey, 2020). Other policy discussions developed by students built on a proposal by 80 national organizations, including the American Postal Workers Union, to use existing postal infrastructure in new ways including checking in on elderly and persons with disabilities for whom mail carriers are the only point of daily in-person contact and the expansion of broadband access in rural areas (A Grand Alliance, 2021). The identification of programmatic uses beyond the current core functions of postal service shifted based on geography. Each student selected a different rural location in New Mexico with some overlaps (See Figure 4) and, while grounded in the above national policy discussion, researched potential uses that would benefit the particular community, provide access to lacking resources, and introduce needed public spaces. Their research led many students to forefront the needs of digitally-marginalized communities that often face a struggle to access essential services due to the 'digital-divide' —the economic and social inequality with regard to access to, use of, or impact of information and communication technologies (ICT) (Pursel, 2005). Students developed additional post office uses in support of Article 9 of the Convention on the Rights of Persons with Disabilities' goal of promoting access for persons with disabilities to new information and communications technologies and systems, including the Internet" (CRPD, 2006). Figures 5, 6, and 7 show examples of student's post office projects that centred on digital communications access as well as shared digital learning and work areas, a laptop library for extending ICT access beyond the post office building, and social gathering spaces. While the traditional services of the post office have historically been a conduit for delivering information by mail, these projects expand the use of government infrastructure to provide digital resources in one of the few civic spaces in rural communities. Beyond these imagined proposals for public spaces and services, each project brought universal design principles and building systems together as a prototype for inclusive design of public institutions.

1	Abiquiú*	13	Dixon	25	Milan	37	Ruidoso
2	Angel Fire	14	Edgewood	26	Mountainair	38	Santa Rosa
3	Aztec	15	El Porvenir*	27	Nageezi	39	Santo Domingo Pueblo
4	Bayard	16	Eunice	28	Nambé	40	Shiprock
5	Belen	17	Flora Vista	29	Ojo Caliente	41	Tierra Amarilla
6	Bosque Farms	18	Gamerco	30	Pecos**	42	Tijeras
7	Chama**	19	Hatch	31	Peralta	43	Trementina
8	Chapparal	20	Lake Roberts	32	Placitas	44	Twin Lakes
9	Chimayó*	21	Lamy	33	Pojoaque	45	White Rock
10	Cimarron	22	Lordsburg	34	Portales	46	White Sands
11	Clayton	23	Los Cerillos	35	Radium Springs	47	Winston
12	Dexter*	24	Mescalero	36	Raton		

Figure 4. Map of New Mexico showing geographical locations of two years of student projects (2020-21)
and table with corresponding place names.
(Source: base map from Google Maps, modified by author).
* Indicates two projects in the same geographic area.
** Indicates three projects from the same geographic area.
Alt text: A terrain map of New Mexico with 47 pins marking post office projects spread across the state.

Figure 5. Rendering of post office design project in Edgewood, NM by Natalie Stephens, 2021.
Alt text: A digital access centre shares the main lobby of the post office. The enclosure is formed of a lightweight concrete waffle slab.
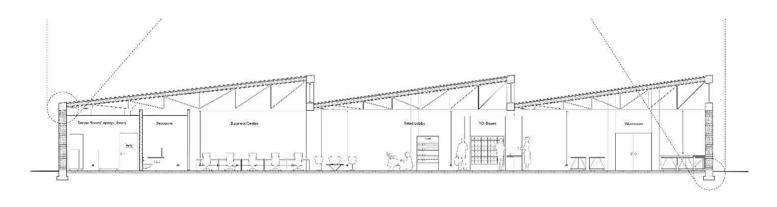

Figure 6. Building section drawing of post office design project in Hatch, NM by Scott Striegel, 2020.
Alt text: The three main structural bays in this section drawing are formed by pitched roofs supported by steel trusses resting on adobe walls.
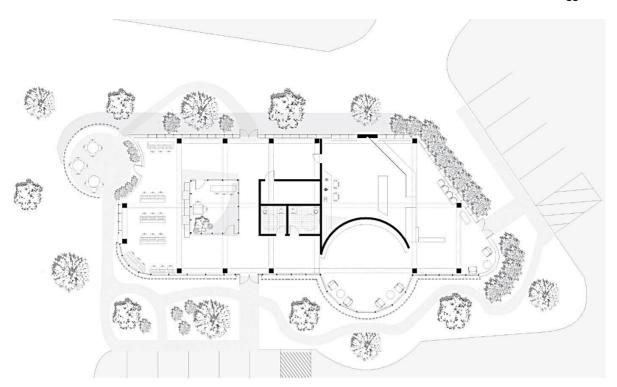
Figure 7. Building plan drawing of post office design project in Shiprock, NM, Navajo Nation, by
Courteney Begay, 2021.
Alt text: The glass façade of the post office is offset a brick skin that creates interior and exterior shading
around the post office and digital access centre.

2.5. Building Systems Reconsidered

The flexibility, adaptability, and comfort at the core of universal design principles
provide a lens for rethinking sustainable environmental techniques. Ruth Morrow and
colleagues have shown how a sustainable environment supports sustainable
communities and that environments that exclude people lead to poorly connected
communities (Morrow, 2002). Adaptable, inclusive building designs that grow with
changing needs can be more affordable and are less likely to be abandoned (Morrow,
2002). In addressing the needs of all people including future uses, universal design
strategies extend the usable life-span of a building. Material assemblies and
environmental systems designed with adaptable and replaceable parts allow for repair
and resiliency over time (Brand, 1994). In the project in Figure 6, an open truss roof
structure, allowing for easy adaptation of mechanical services, is supported by adobe
bricks with traditional lime plaster. The incorporation of adobe wall systems uses local
sustainable building practices making maintenance, an important component of ensuring
universally accessible environments over time, more feasible. The services provided in
building construction need to plan for adaptability so they can be modified as the needs
of society change (Koff, 1977) and in response to changing climate conditions and the
incorporation of future technologies.

In the two years of the building systems course assessed in this case study, many
students employed vernacular materials, forms, and assemblies. They observed that
vernacular construction techniques could be more sustainable with respect to material

ecology and cradle to cradle principles (McDonough and Braungart, 2002) while creating more geographically-attuned interior environments. The project in Figure 8 integrated local granite stone construction techniques into wall assemblies with passive earth cooling tubes for ventilation and climate control. The universal design goal of reinforcing cultural values and the social and environmental context of design projects (Steinfeld and Maisel, 2012) presents the opportunity to think about the sustainable efficiency of building systems in concert with rural cultural contexts. A key component of incorporating universal design into passive systems, which rely heavily on daily operation, is ensuring that passive building components can be used by all people to the greatest possible extent. In the design in Figure 3, lower openings in the rammed-earth facade both increase the stack effect to improve ventilation while facilitating accessible operability. These design proposals recast vernacular building systems and materials as systems of inclusion.
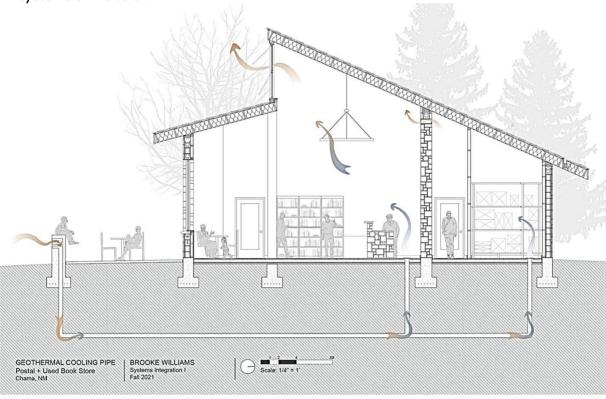

Figure 8. Building section drawing of post office design project in Chama, NM with earth cooling tubes for ventilation and climate control by Brooke Williams, 2021.
Alt text: Arrows show the flow of air through a geothermal cooling pipe into the interior space and out through a clerestory window.

2.6. Distributed Needs Research
Replacing minimum standards for accessibility within curricula with inclusive design criteria is also enacted through research methodologies. While educational institutions are clustered in urban or suburban areas, many students come from or have ties to rural communities. In our context, the university hosts the only accredited architectural program within a state that includes expansive distributed populations, long-standing historic communities, and Indigenous territories. The focus on rural public spaces and

aging populations is a means for students to bring their own diverse backgrounds, places of origin, and histories into their academic studies. Sustaining cultural pluralism is an essential component of the democratic project of schooling and "culturally sustaining pedagogy" (Paris, 2012). According to the U.S. Census, "[i]n many ways, New Mexico is the definition of diversity" with about 48 percent of people in the state identifying as "Hispanic or Latino" (U.S. Census Bureau, 2017) and the third highest percentage of "American Indian and Alaska Native" of any state at 14.5 percent (NCAI, 2020). Considering the diverse contexts of rural post offices in New Mexico can making space for the diverse backgrounds of students in a classroom and allow everyone (including faculty) to invested in learning together (Kishimoto, 2018). Jessi Smith and colleagues observed that for Native American STEM students, STEM did not appear to fulfil communally-oriented desires to give back to and improve the quality of life for their tribal communities (Smith et al, 2014, cited in Taylor et al, 2019). This in part stems from a lack of cultural relevance in the framing of syllabi, coursework, and projects (Taylor et al, 2019). While not without its challenges and shortcomings (discussed in the next paragraph), the approach of this case study was to engage their own communities and relatives in the formation of user needs research. Rather than partnering with a single community or organization, students selected a rural location that in many cases they have direct or historical ties to. In their project development, students interviewed aging family members and other stakeholders and received feedback to gain participation in the design process. Given the prevalence of jobs created by the postal system in rural areas (Blevins, 2021), it should not have been surprising that multiple students either had direct or distant relatives that worked in post offices or in mail delivery in small towns and communities.

The assessments performed by students were incorporated into the invention of expanded post office programs and into understanding the role and use of post offices in particular geographies. This model of user assessment and research poses several challenges. While creating a means for many students to directly engage their own communities, places with which they had historical ties, or learn from the communities of others, the performance of this distributed ethnographic research was unevenly distributed. Not all students identified connections to rural areas (in any location) and the lack of travel due to COVID-19 restrictions prohibited them from making connections in person.

3. Conclusion
Building systems courses can play a significant role in architecture curriculum to advance toward a more sustainable and just built environment and toward equal participation of all persons. Universal Design principles suggest intersectional strategies for rethinking how building-related impacts are taught around inclusion/exclusion, access, and health disparities. As buildings are a major source of pollutants both in their operation and construction—involving energy-intensive materials, toxins, and polluting energy sources—marginalized communities have faced the most severe impacts of environmental degradation. These impacts can be further overlooked in rural areas where effects are spread across vast territories. Efforts to bring environmental justice indoors could be led by federal governments whose policies have historically allowed or led to environmental racism. In bringing together design strategies that support

concentrations of aging populations in rural areas, equal access by all people, sustainable building practices, and programmatic uses that increase access to vital resources, post offices can serve as a prototype for building inclusive public spaces. While the integration of universal design principles into technical building systems courses can benefit students by disrupting our understanding of and practices related to technology, they can also be a generative site for bringing critical attention to social inclusion in the built environment.

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