© Journal of Higher Education Outreach and Engagement, Volume 30, Number 2, p. 125, (2026)
 eISSN 2164-8212

Shaping Cities, Shaping Lives: The A+STEM Summer Camp Promising Journey

Mihwa Park, Kuhn Park, and Bernard J. Wekullo

Abstract

The A+STEM summer camp introduced high school students to design thinking and architectural model design while integrating STEM concepts. Participants engaged in hands-on activities aimed at revitalizing downtown Lubbock, Texas, focusing on empathy, ideation, prototyping, and testing as a design thinking process. Under the mentorship of Texas Tech University undergraduate students, camp participants developed architectural models addressing community challenges, which were later showcased at the Texas Tech University Museum. The camp successfully enhanced students' design thinking, STEM and architectural knowledge, skills, and interest in architecture while fostering a community engagement mindset. Proposed improvements include extending the camp duration and involving public officials to enrich the learning experience and promote real changes within their communities.

Keywords: summer camp, STEM, architecture, design thinking, city design

In 2023, the City of Lubbock, Texas, had a population of over 260,000, representing diverse racial and ethnic backgrounds. The population included 47.6% non-Hispanic White, 35.6% Hispanic or Latino, and 9.6% Black or African American. The city has been experiencing steady growth, with a projected 3% increase by 2028 (Lubbock Economic Development Alliance, 2024). One of the main attractions in the City of Lubbock is Texas Tech University, a Hispanic-Serving Institution with an enrollment of over 40,000 students and a faculty of more than 2,000. Texas Tech University also boasts a statewide economic impact of $3.5 billion (Texas Tech University Institutional Research, 2024). As both the city of Lubbock and Texas Tech University continue to grow, the revitalization of downtown Lubbock has become a priority (PlanLubbock 2040, n.d.). To align with the city's initiatives, address community needs, and inspire high school students through a community-engaged project, the first author proposed a summer camp project focused on revitalizing downtown Lubbock. More specifically, the summer camp was developed in response to observed conditions in downtown Lubbock and was informed by consultation with local expertise and publicly available planning documents. As residents of the city and through repeated site visits, the authors observed that many historic buildings and large areas of downtown consisted of vacant or underutilized parcels, with relatively few visible family-oriented gathering spaces. These observations were further contextualized through discussions with a colleague who is an architecture expert, who identified similar patterns of aging infrastructure, limited public activation, and unrealized potential within the downtown built environment. In addition, municipal planning documents and public reporting, including the Downtown Lubbock initiative (PlanLubbock 2040, n.d.), explicitly frame downtown revitalization, public space activation, and reinvestment as civic priorities.

Guided by an asset-based perspective, these conditions were interpreted not as deficits but as latent community assets—such as historic structures, centrally located public

spaces, and ongoing revitalization efforts—that could be engaged through new architectural installations and educational programming. Although the initial identification of need emerged from observation, lived experience as city residents, expert consultation, and document analysis rather than from direct community interviews, the summer camp was intentionally designed to create opportunities for youth and community members to actively engage with and reinterpret these existing assets. The camp thus functioned as an exploratory, place-based initiative that aligned with documented civic priorities and leveraged local expertise to support more inclusive and intergenerational engagement in downtown Lubbock.

In 2023, the first author led the project's design and grant proposal and secured funding from the Helen Jones Foundation, Inc. The project offered a one-week summer camp for high school students in the city, providing participants with authentic experience in community-based architectural design. The camp aimed to strengthen students' design thinking skills, cultivate a disposition toward community engagement, and foster positive attitudes toward science, technology, engineering, and mathematics (STEM) and architecture.

Design thinking (DT), developed by Stanford's Design School (d.school) and IDEO, is a holistic and iterative approach to creative problem-solving (Auernhammer & Roth, 2021). DT integrates diverse disciplines in both practice and research and focuses on empathizing with users' experiences, generating innovative ideas, and finding solutions within an interdisciplinary context (Rauth et al., 2010). In this project, architecture was selected as the interdisciplinary and human-centered learning context, as it inherently transcends multiple disciplines such as art, STEM, and social science (Rendell, 2004).

During the 2024 A+STEM (Architecture plus STEM) summer camp, high school students were introduced to how STEM and architecture could create more human-centered and environmentally friendly communities. They engaged in hands-on activities to solve real-world problems using DT. Specifically, we guided camp participants through the DT process, encouraging them to (1) empathize with community members' experiences and challenges that could be addressed through architectural designs, (2) define meaningful and actionable problems, (3) ideate creative solutions, (4) create prototype models of their most feasible ideas, and (5) test their models to improve their design. After the summer camp, the students' architectural models were showcased at the Texas Tech University Museum, providing community members with broad community engagement opportunities.

In the following sections, we explore the intersection of three aspects of architecture: sustainability, well-being, and community engagement.

Sustainability in Architecture

In architecture, sustainable practices aim to minimize environmental impact throughout a building's life cycle (Givoni, 1998). Implementation of these practices includes reducing embodied energy and the environmental footprint during construction (Nainggolan et al., 2020) while considering factors such as design, materials, energy use, cost, and environmental concerns (Varma et al., 2014). Sustainable elements like passive solar design, green roofs, natural ventilation, and the use of recycled materials can address climate change while promoting environmental stewardship (Fernando et al., 2023). Recently, the importance of climate literacy and sustainable design techniques in architectural education has been drawing attention (Schiano-Phan & Soares Gonçalves, 2022). In designing the A+STEM summer camp project, we emphasized understanding local environmental and social challenges, such as water conservation, energy efficiency, and public transportation accessibility in the city of Lubbock, as this understanding enables community members to recognize and address sustainability needs within their communities (Farzaneh et al., 2009).

Promoting Well-Being Through Architectural Design

Innovative architectural interventions can enhance community well-being by promoting social inclusion and improving the quality of life (Scott, 2015). Well-designed community spaces foster a sense of belonging for community members, which, in turn, boosts overall well-being for them. Ryan et al. (2014) highlighted the importance of integrating well-being principles into architectural education. They emphasized the need for spaces that enhance comfort, productivity, and emotional wellness. Similarly,

Mohamed and Ibrahim (2024) stressed the importance of designing environments that prioritize human comfort and happiness, which contributes to healthier and more fulfilling living spaces. Therefore, we incorporated a workshop into the camp curriculum specifically focusing on this aspect, well-being, of architectural design.

Community Engagement in Architecture

Community-based architectural projects provide students with opportunities to engage with community members and consider community needs in the design processes (Scott, 2015). This approach underlines the importance of incorporating multiple voices to develop functional, cost-effective, and secure spaces while addressing equity, inclusivity, and environmental sustainability, potentially shaping public policies. Diefenthaler et al. (2017) argued that DT, when applied to real-world problems, fosters student collaboration and integrates creative and analytical skills essential for community engagement and the architectural design process.

With these three aspects of architecture, as previously mentioned, we adopted the DT process in creating architectural models for a community-based project during the summer camp.

Integrating Architecture and Design Thinking in the Summer Camp Project

We designed the A+STEM summer camp curriculum, combining community engagement, sustainability, and well-being goals with DT's real-life problem-solving approach. Below, we provide details on the camp curriculum.

Camp Curriculum Design

In 2024, we offered a 5-day summer camp for high school students in the city of Lubbock. We collaborated with a university-based outreach STEM center and local school districts to recruit students interested in participating in the camp. Working in partnership with three school districts and the outreach center, prospective students were invited to submit brief applications describing their interests and motivations for joining the camp. After reviewing the applications, we selected eight local high school students based on demonstrated interest and alignment with the camp's goals. One eligibility criterion for participation was that students had to be residents of the local area. Those high school students (mentees) were paired with seven undergraduate architecture majoring students (mentors) from Texas Tech University. Each mentee was paired with one mentor, except for one team with two mentees and one mentor. Table 1 provides each day's DT process and the main activities of the camp.

Day 1. Introduction to DT and Architecture's Role in Urban Spaces (Empathize)

The first day of camp focused on understanding DT and exploring the relationship between cities/towns and architecture. As part of the first process of DT, "Empathize," students participated in activities that helped them understand how city designs and architecture impact community members' daily life. A faculty member with expertise in embodiment, perception, and social processes in the built environment led a workshop on this topic. The workshop explored how cities are designed differently across regions and countries and how they impact human life.

During the session, mentee students reimaged downtown Lubbock using a collage method with city maps, envisioning a more equitable city for all citizens. Afterward,

Table 1. A+STEM Summer Camp

	Day 1	Day 2	Day 3	Day 4	Day 5
DT process	Empathize	Empathize-Define-Ideate	Ideate-Prototype	Prototype-Test	Test
Main activities	Workshop 1: Design Thinking	Workshop 2: Sustainable Society	Designing prototype	Evaluate the prototype	Present the revised model
	Field trip to TTU campus	Workshop 3: Public Wellness	Creating a prototype model	Revise the prototype model	Evaluate the model
					Award ceremony

mentees, mentors, and the project team walked around Texas Tech University campus to observe architectural installations and landscapes designed to promote human life and well-being. For example, mentees were asked how three rows of trees planted on campus influenced the environment, and they answered that the specific landscape design provided shaded spaces where people could relax between the trees and avoid the city's intense summer sunlight.

Day 2. Empathize, Define, and Ideate

The second day started with the "Empathize" stage to reemphasize the importance of understanding the community context. Next, the camp activity was designed to transition into identifying problems within their community, "Define," and generating initial solutions, "Ideate." To achieve these goals, two workshops were held on that day.

The first workshop on Day 2, led by an expert specializing in sustainability and material resonance in architecture, introduced mentees to the concept of sustainability in architectural design. Mentees explored how different building materials create economic, environmental, and political challenges and interact with various construction materials while comparing their sustainability and cost-effectiveness.

The second workshop on Day 2 focused on architectural design for well-being, inclusivity, and accessibility. A health and wellness design expert demonstrated how designs can promote people's well-being. Through hands-on activities, mentees experienced challenges faced by individuals with special needs, such as visual impairments or mobility difficulties, and learned how thoughtful design can improve their quality of life. These hands-on activities included wearing glasses designed to simulate visual impairment and navigating hallways in a wheelchair, among others. When architectural or object designs are created to be more inclusive for a broader population—for example, doors that are easy to open, ramps with lower slopes, or the use of bright colors to highlight potential hazards—these features benefit not only people with disabilities but also the general public. For instance, families with young children can use lower ramps more easily when pushing strollers, and bright, visible designs can help prevent accidents for everyone. Inclusive design, therefore, enhances accessibility, safety, and convenience for all users, not just those with mobility challenges or visual impairments.

After the two workshops, mentees were presented with an image of an underutilized area in downtown Lubbock (see Figure 1) and asked to identify problems or issues in the space. The mentee students then defined problems and ideated potential solutions for revitalizing the area, incorporating the concepts they had learned from all workshops. In this process, we did not ask or require students to design their models for a specific population; rather, we encouraged them to create more inclusive designs that could serve a broader range of people, for example, from children to older adults. This stage helped the students develop awareness of local challenges and begin the process of ideating solutions.

Day 3. Ideate and Prototype

On the third day, the focus shifted to refining ideas and creating prototype models (see Figure 2). Each team (mentor and mentee[s]) developed a new design for the alley to make it more accessible, equitable for all populations, and culturally vibrant. Mentors guided their mentees in articulating and visualizing their ideas without directly imposing their own suggestions. This allowed each team to create their first prototype models, mostly using paper materials.

Day 4. Prototype and Test

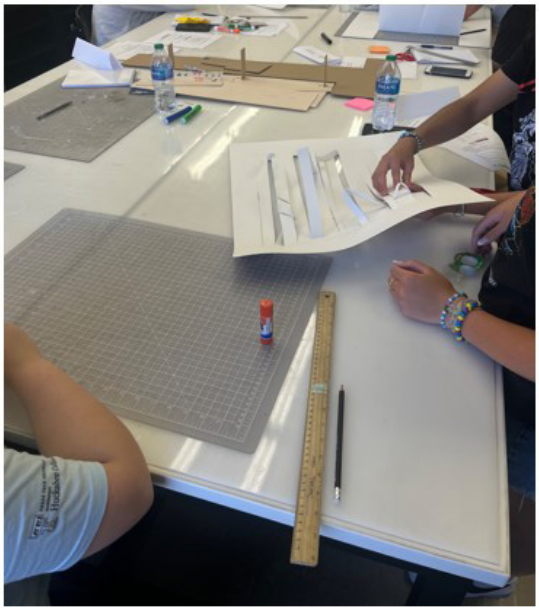
Day 4 was dedicated to receiving feedback and refining prototypes. Each team presented their designs to mentors, peer campers, and the project leaders, including authors and an architectural designer with extensive urban architecture experience. The mentors and project leaders asked questions about the motivations, purpose, and expected outcomes of each design, while also offering suggestions on key considerations such as street layout, visitor flow, noise levels, seasonal weather, and potential city events. This feedback process aligned with the "Test" phase of the DT process. After receiving feedback, the teams revised their models and printed them using 3D printers, with the printed models available for pickup the next day.

Day 5. Final Test and Presentation

On the final day of the camp, students picked up their 3D-printed models from a printing room and returned to the classroom to prepare their presentations. Each team presented their project to all the members

Figure 1. An Underutilized Alley in Downtown Lubbock

Figure 2. Designing Prototype Models



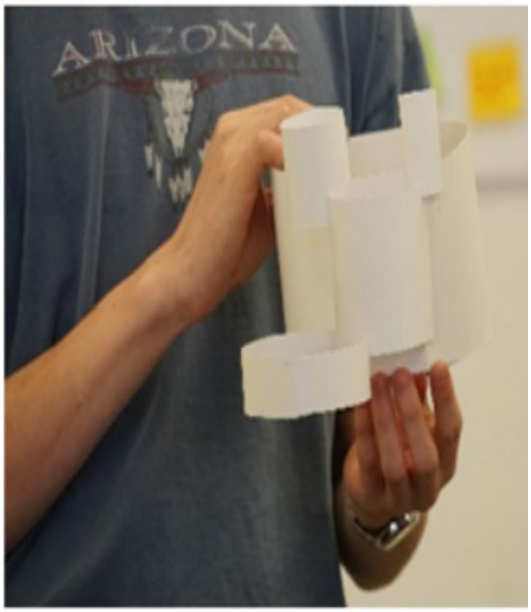


Figure 3. Circa Park, Its 3D Model and Presentation

Table 2. Survey Participant Student Information

Gender	Race	Grade
Male = 2	Either Hispanic or Latino = 3	11th grade = 2
Female = 3	White = 2	10th grade = 2
		9th grade = 1

of the camp. Figure 3 highlights one of the presentations: "Circa Park." This project proposed a trampoline park for all ages, featuring nine slides of various sizes, three drink stations, and two interconnected slides at the northern end. The design included an upper level soda bar, adding a fun way for visitors to descend to the ground floor. To address the city's intense summer sunlight, the team designed trampolines using perforated, skinlike tubing and added safety nets to prevent accidents. Bold colors were chosen to enhance visibility, especially for senior citizens. To address the issue of dehydration in the city's dry climate, the design included hydration stations with water dispensers. The goal of the design was to create a space where families and children could enjoy time together without paying extra money, with a variety of beverage options available at the soda bar and free water available at hydration stations. The mentee who designed the park mentioned that the city lacked a space where children could play with their families, and most family entertainment places are costly. Therefore, he wanted to address the issue in his design.

Potential Impacts on Students and Community

With the approval of the IRB at Texas Tech University, five mentee students participated in both a survey and individual interviews with the first author. The survey was administered at the beginning of the camp, and the interviews took place on the final day of the camp.

Survey Design and Results

The survey aimed to explore participants' motivation for applying to the summer camp, their expectations about the camp, and their perceptions about themselves. All items utilized a Likert scale, such as participants indicating their level of agreement with statements by selecting from five choices: strongly agree, agree, neutral, disagree, or strongly disagree. Table 2 shows the survey participants' information.

Regarding their motivation for applying to the camp and expectations about the camp, the survey results showed a mix of enthusiasm and uncertainty among participants. Specifically, all five students expressed

optimism about their chances of success in the camp and were excited to learn the information and skills necessary for the camp's final project. They found the camp engaging, especially the hands-on activities, and showed a strong interest in participating. However, despite their initial excitement, they expressed doubts about applying knowledge and skills gained from the camp to their everyday lives. This result suggests that, although they viewed the camp as a fun and enriching experience, they did not view the activities as directly relevant and impactful for their lives or communities. Consequently, they had low expectations that they could apply the skills and experiences from the camp to contribute to their community. These findings highlighted an opportunity for the project team to foster self-efficacy and confidence in mentees by guiding them to engage in community-based projects through the DT process. Providing local high school students with opportunities to work with mentors and engage in a carefully designed curriculum helped mentees develop a community engagement mindset and self-efficacy, enabling them to see how they could contribute to their local community.

They also rated themselves highly in several areas of confidence, including producing high-quality work, respecting their peers, making independent decisions, and collaborating with others. However, the survey results revealed low self-perceptions in leadership and interpersonal skills. These findings emphasized to mentors the importance of facilitating the design process rather than leading it to ensure that mentees took ownership of the project. Further, to build rapport, mentors were encouraged to engage with mentees in meaningful ways, such as greeting them at the drop-off location in the morning, having lunch together, and accompanying them to their pickup location every day. Additionally, the camp curriculum included activities like team reflection sessions, classroom presentations, and group discussions to foster collaboration and communication throughout the program.

Interview With Mentee Students

We asked five mentee students—Adrian, Milo, Camila, Gemma, and Miranda (all pseudonyms)—about their reasons for applying to the camp, their experiences during the camp and with their mentors, and how the camp had impacted them in their career path and in any way. They explained that their goal in attending the camp was to get a sense of the architecture field, interact with professionals and mentors to understand career paths in architecture and STEM, and use the camp experience to determine if STEM and/or architecture were the right fit for them.

When asked what resonated with them most, Adrian said, "The camp has allowed me to unleash my creativity." Similarly, Milo expressed his enthusiasm to "learn how to design," indicating his excitement to learn architectural design. Camila and Gemma found exploring Texas Tech University campus and several architectural structures inspiring for their final projects. Miranda shared that building relationships with her mentor was essential in deepening her understanding of architecture, developing relevant skills, preparing her for future educational pursuits, and making valuable connections in architecture.

The students were also asked if the camp influenced their interest in pursuing a STEM or architecture-related career. They agreed that the camp influenced their decision to pursue that career path. For instance, Adrian said, "I changed my viewpoint on architecture a little bit, getting to know the benefits of going into architecture and how it impacts society." This shift highlights his growing recognition of architecture's broader role in shaping communities and addressing societal challenges. Camila shared her desire for creative design work, saying, "I want to do floor plans, like do all the measurements, and things like that, just to create my own building, like from my mind, and what I think what that space would be like. Especially including like the landscape." Similarly, Milo noted that the camp had made him "more like keen to continue with architecture because it is kind of really showed me what you will be like doing. And it gave me a good insight of what it will be like going through school with architecture," as it provided clear insight into what to expect in the field.

Regarding their experience with mentors, they commonly expressed their appreciation for the guidance they received. Adrian said,

> My mentor was really, really helpful because although he gave me like maybe some advice, he didn't really like take control. He really gave me like that freedom to use my own

> mind and figure out how to make things better.

As previously mentioned, roles of mentors were emphasized, which included not giving their mentees answers or ideas, but guiding them to identify problems, ideating their design, and finding where and how to improve their prototype of design so that they would have ownership of their projects. Camila said,

> She [Mentor] really helped me like think more like, about how people are going to move around the space, what the space is going to be used for, and really helped me like with the design of the canopy, and how like each line will affect the design that's going to be shown on the floor with the sun.

This response affirms that mentors played a key role in fostering critical thinking, creativity, and problem-solving, while still giving students autonomy to develop their ideas. Miranda also appreciated her mentor's balance between professionalism and approachability, saying, "She's like a great mentor and has a good work ethic that I like to learn from because she can still have fun and likes jokes and likes to laugh around but also gets what she needs to do." This description highlights the importance of building rapport between mentor and mentee while maintaining professional boundaries.

Regarding the most challenging aspects of the project, most students identified the initial design phase as the most complex process. Milo said, "Probably the designing part because there were like many times I really, I did not really know what I was doing and so my mentor really helped me with that." Not just Milo, but other mentees also mentioned similar experiences, highlighting the importance of mentors' roles.

When asked about their plans and views to contribute to their communities, the mentees offered thoughtful responses. Miranda mentioned that the camp had taught her to identify places that needed improvements, reflecting a growing understanding of how her experience through the camp could be applied to real-world challenges. Milo noted, "I see myself contributing to my community because my idea was like a trampoline park because in that area like near LHUCA (The Louise Hopkins Underwood Center for the Arts, Lubbock), there is like nothing for children to do." His idea demonstrated an awareness of local needs and a desire to address them through design. Adrian emphasized both function and aesthetics, saying,

> I think in my community, it's less focused about how architecture looks and more focused on what architecture does. So, in my community, I can help with both and sort of be able to do architecture that has a good function but also good design.

These responses align with contemporary views on socially responsible architecture, where design serves both practical and aesthetic purposes to improve people's lives and communities' well-being (Schiano-Phan & Soares Gonçalves, 2022).

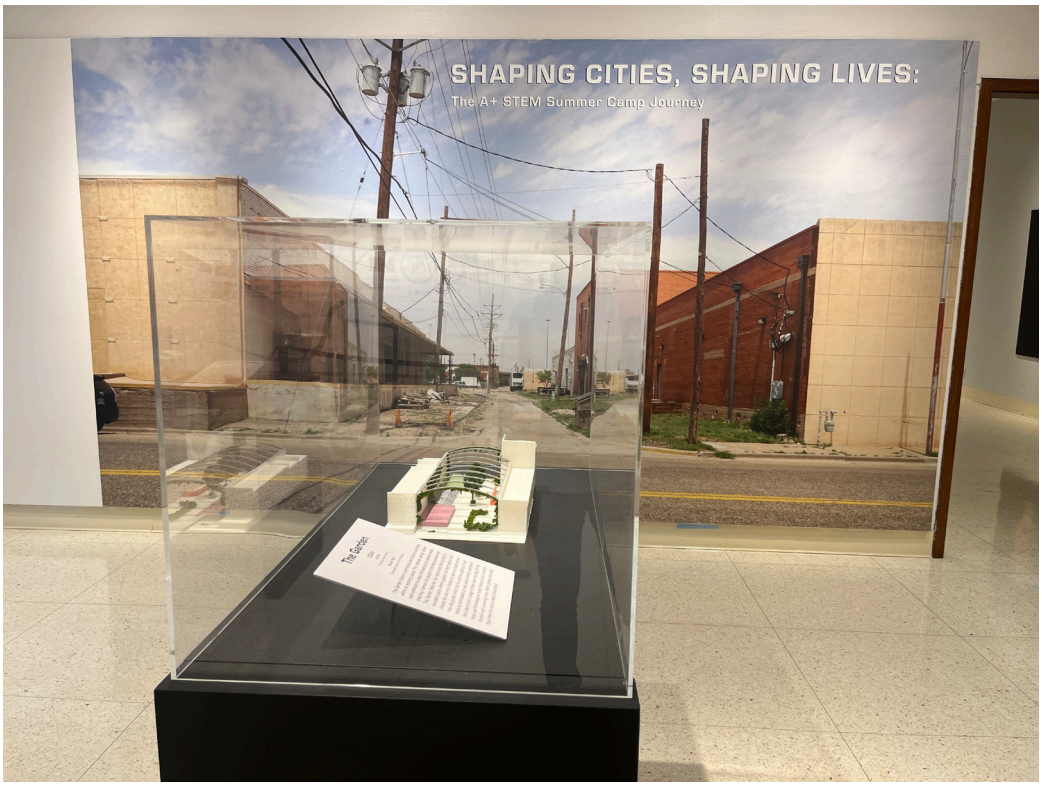
Broadening Community Engagement

To expand community engagement, the final products were showcased at the Texas Tech University Museum in Fall 2024 (see Figure 4). As of the submission of this manuscript, the exhibition was ongoing, having started on November 13, 2024, and scheduled to conclude on January 31, 2025.

Conclusion

The primary goal of this project was to offer high school students the opportunity to design architectural models that positively contribute to their neighborhoods and communities. Using DT as a central framework, the A+STEM summer camp was created to raise awareness of community issues that can be addressed through architectural design, while also promoting the integration of STEM knowledge and skills. This inaugural summer camp successfully brought together local students and experts, yielding promising results that support the three main goals of the project: enhancing students' design thinking skills, cultivating a mindset for community engagement, and fostering positive attitudes toward STEM and architecture. Participating students (mentees) were highly engaged in all camp activities through the iterative DT process and successfully created their own architectural models. Interviews further revealed an increased awareness of community challenges and enhanced career interests, especially in architecture. The project aimed

Figure 4. Texas Tech University Museum Exhibition



to inspire and nurture students' confidence in their ability to contribute to their communities while sparking career aspirations in STEM and architecture through authentic, hands-on, community-engaged projects. The project is noteworthy in that it aimed not only to address community needs but also to cultivate youth participation and awareness of community-engaged work. From our perspective, community-engaged projects are most effective when they are collaboratively designed with community partners to address clearly identified needs. At the same time, it is equally important to support young people in recognizing community needs and to provide opportunities for them to develop the mindset, skills, and interest necessary to contribute meaningfully to their communities. Community-based and place-based projects can play a critical role in fostering this development while also supporting broader community well-being. In this regard, we argue that the summer camp offered a unique and successful opportunity for local youth to engage as emerging community partners and to envision themselves as active contributors to future community-engaged initiatives.

The exhibition at the Texas Tech University Museum provided a broader platform for community members to engage with these issues, showcasing how architectural designs can address local problems. At the time of submitting this manuscript, the exhibition was still ongoing, and we expect that feedback from visitors will offer valuable insights, as a designated station at the museum allows them to leave comments specifically about the project.

Through participation in A+STEM summer camp and close mentorship from undergraduate architecture students, the high school students were able to enhance their skills, competence, and interest in architecture. We believe that this project provided a valuable opportunity for students to connect architectural and STEM knowledge with a community-based project, demonstrating how these skills contribute to building stronger and healthier neighborhoods.

In summary, the summer camp provided participating high school students with hands-on experience in architectural design using the DT process, offering educational opportunities not typically available in a

standard school curriculum. The rapport between students and their mentors fostered a supportive and encouraging learning environment. One of the key aspects of this project was its public outreach effort, with the museum exhibition serving as a platform to showcase the students' achievements and learning journeys to the broader community. The final architectural models created by the students demonstrated the potential of community-based design solutions to improve local neighborhoods.

However, there are areas we aim to improve in the future. Although the students successfully incorporated STEM concepts such as the sun's motion, thermal energy transfer, color visibility, motions, force, and so on into their design, they often failed to explicitly mention these concepts in their presentations. Moving forward, we will place greater emphasis on the integration of STEM aspects into their final products. We administered a survey to see participant students' motivation in joining the camp at the beginning of the camp. In the future, incorporating pre- and postsurveys on participants' design thinking skills, attitudes and career aspirations toward STEM and architecture, as well as their self-perceptions and expectations of the camp, would provide valuable insight into how the camp influences students in these areas. Additionally, the 5-day camp schedule felt rushed, with only one day allocated for revisions of their models. Extending the camp to 2 weeks would allow mentors and mentees more time for exploration, ideation, and refinement of their prototype models. We also would like to include field trips beyond the campus to help students identify real-world issues firsthand, giving them greater ownership over their projects and encouraging more diverse solutions.

We note that the invitation and advertising for the exhibition were not marketed broadly to the public. In the future, the exhibition should be promoted earlier and more widely, with targeted outreach and invitations to community members, public officials, and professionals. We would like to invite representatives from the City of Lubbock and the Lubbock Economic Development office to participate in the summer camp, with the hope that they will share the city's plans and vision with the campers. Their involvement would enhance students' learning by providing expert insights into city planning and design. The foundation's support was limited to one year without the option for extension; therefore, we are currently seeking additional grants to support this project. We have been exploring funding opportunities that offer longer term support and allow for possible modifications to ensure the project's continuity. Since exhibition costs in a museum represent a significant portion of the budget, we are considering an online showcase featuring student video presentations as a more sustainable alternative. Additionally, we plan to restructure the summer camp as a low-cost program—covering only materials and lunch—for high school students, which will help reduce overall expenses while maintaining meaningful learning experiences. With this reduced budget, we are optimistic that securing a grant to support the project will be easier.

Ultimately, the showcase of students' activities and products during the A+STEM summer camp will serve as a strong foundation for future versions of the camp. We look forward to expanding the camp's reach beyond the city of Lubbock and continuing to inspire and empower students to contribute to their communities through the intersection of architecture and STEM.

Acknowledgments

This project was supported by the Helen Jones Foundation, Inc.

About the Authors

Mihwa Park, PhD, *is an associate professor of science and STEM education at Texas Tech University. Her research focuses on STEM community-engaged scholarship, students' academic emotions, self-regulated learning and science identity, and teachers' professional identity in teaching science. She earned her PhD in science education from the University at Buffalo.*

Kuhn Park *is an associate professor and associate dean for academic affairs in the Huckabee College of Architecture at Texas Tech University. He is an architectural and computational designer and director of the Design Computation and Fabrication program (DCF), a Master of Science and certificate program. He received his M.S. in Computational Design from Carnegie Mellon University.*

Bernard J. Wekullo *is a doctoral candidate in the Department of Curriculum and Instruction (STEM Core) and a research assistant at the College of Education, Texas Tech University. His research interests focus on the application of emerging technologies in K–12 mathematics instruction and culturally responsive STEM education pedagogy.*

References

Auernhammer, J., & Roth, B. (2021). The origin and evolution of Stanford University's design thinking: From product design to design thinking in innovation management. *Journal of Product Innovation Management, 38*(6), 623–644. https://doi.org/10.1111/jpim.12594

Diefenthaler, A., Moorhead, L., Speicher, S., Bear, C., & Cerminaro, D. (2017). *Thinking and acting like a designer: How design thinking supports innovation in K-12 education.* Wise & IDEO.

Farzaneh, M., Lee, J. S., Ramani, T., Higgins, L., & Zietsman, J. (2009). *Toward a green campus: A transportation strategy for Texas A&M University* (Report No. 167174-1). Texas Transportation Institute.

Fernando, D., Navaratnam, S., Rajeev, P., & Sanjayan, J. (2023). Study of technological advancement and challenges of façade system for sustainable building: Current design practice. *Sustainability, 15*(19), Article 14319. https://doi.org/10.3390/su151914319

Givoni, B. (1998). Climate considerations in building and urban design. John Wiley & Sons.

Lubbock Economic Development Alliance. (2024). *Population.* Retrieved November 1, 2024, from https://lubbockeda.org/life-in-lubbock/population/

Mohamed, A. S., & Ibrahim, V. A. R. (2024). Towards a sustainable future: Exploring the integration of architecture education, innovation and sustainability. *SVU-International Journal of Engineering Sciences and Applications, 5*(1), 49–63.

Nainggolan, S. M., Dewi, O. C., & Panjaitan, T. H. (2020). 10 criteria of sustainable housing: A literature review. In *Proceedings of the 3rd International Conference on Dwelling Form (IDWELL 2020)* (Advances in Social Science, Education and Humanities Research, 475, pp. 42–53). Atlantis Press. https://doi.org/10.2991/assehr.k.201009.005

PlanLubbock 2040. (n.d.). *Comprehensive plans.* City of Lubbock, Texas. Retrieved October 18, 2024, from https://ci.lubbock.tx.us/departments/planning/comprehensive-plans

Rauth, I., Köppen, E., Jobst, B., & Meinel, C. (2010). Design thinking: An educational model towards creative confidence. In T. Taura & Y. Nagai (Eds.), *DS 66-2: Proceedings of the 1st International Conference on Design Creativity (ICDC 2010).* The Design Society. https://www.designsociety.org/publication/30267/design_thinking_an_educational_model_towards_creative_confidence

Rendell, J. (2004). Architectural research and disciplinarity. *Architectural Research Quarterly, 8*(2), 141–147. https://doi.org/10.1017/S135913550400017X

Ryan, C. O., Browning, W. D., Clancy, J. O., Andrews, S. L., & Kallianpurkar, N. B. (2014). Biophilic design patterns: Emerging nature-based parameters for health and well-being in the built environment. *Archnet-IJAR: International Journal of Architectural Research, 8*(2), 62–76. https://doi.org/10.26687/archnet-ijar.v8i2.436

Schiano-Phan, R., & Soares Gonçalves, J. C. (2022). Sustainability in architectural education. *Sustainability, 14*(17), Article 10640. https://doi.org/10.3390/su141710640

Scott, E. A. (2015). *SPA design and architecture: Understanding single-page web applications.* Manning Publications Co.

Texas Tech University Institutional Research. (n.d.). *Faculty headcount by full/part-time—Fall 2023.* Faculty Historical Count. Retrieved October 18, 2024, from https://www.depts.ttu.edu/irim/FacultyHistorical/index.php

Varma, K., Chaurasia, M., Shukla, P., & Ahmed, T. (2014). Green building architecture: A literature review on designing techniques. *International Journal of Scientific and Research Publications, 4*(2), 583–584. https://www.ijsrp.org/research-paper-0214.php?rp=P262336