Opportunities and challenges for service-learning experiences in informal urban settlements

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Abstract

Purpose – The purpose of this article is the discussion of a service-learning experience in architecture pedagogy, based on two core courses at a private university in Mexico. The aim is to identify learning opportunities, challenges and implications arising from engaging with inhabitants of an informal urban settlement with limited digital resources in La Campana-Altamira in Monterrey, Mexico.

Design/methodology/approach – The methodology selected is a case study approach, chosen for its effectiveness in architectural pedagogy to create knowledge through exposure to a particular phenomenon, as well as highlight positive teaching practices to facilitate replicability. Case-study methodology was also beneficial in this case because its openness and flexibility allowed for research of a variety of phenomena simultaneously, in this case, both the effects in the informal settlement community and in the academic one.

Findings – Findings revealed that opportunities outweigh challenges, and meaningful service and learning are possible in an online context, even when the service aspects take longer than the course length if there are long-term relationships between communities and institutions.

Originality/value – The value of the article lies in the need for flexible and sensitive approaches that put communities in the center, a critical path to identifying and understanding their needs and improving their contexts. This holds especially true given the rapid pace of worldwide urbanization and the ubiquity of informal urban settlements. Implementing service-learning approaches in informal settings using online tools, while sanitary restrictions are in place shows that meaningful experiences can be achieved, even when courses are short and resources are limited.

Keywords Community-based, Service-learning, Educational innovation, Informal settlements, Ethnographic methods

Paper type Research paper

Introduction

Service-learning became the mainstream in the 1970 and 1980s. Since then, it has gained attention as an educational process with a practical work component and strong citizenship orientation. Service-learning emphasizes preparing students with the accumulation of "practical training" to build on their academic and professional instruction while pushing for closer ties with the real world, thereby increasing social equity and community improvement (Schuman, 2006) In Mexico, service-learning became mandatory as early as in 1936, after the Revolution, and eventually, interest in service-learning reached architecture, planning and design.

This article presents the service-learning experience during two undergraduate architecture courses at Tecnologico de Monterrey, Mexico. Due to the Covid-19 pandemic, the courses were

taught online. This work highlights the potential of service-learning as a teaching experience for the discipline of architecture and its implications in informal urban settlements.

The article is structured in five sections. Section 1 presents the literature review on service-learning and a working definition. Methodology, section 2, introduces the research questions and urban and institutional contexts. It also offers the e-service-learning case study in Campana-Altamira. Opportunities, challenges and implications arising from this experience are examined in section 3, findings. Section 4 presents the discussion preceding the conclusions in section 5.

Literature review
Service-learning
Service-learning has been conceptualized as a means to add value to social services, fostering service, interactions and connections between communities and higher education institutions to promote civic responsibility and a more active citizenry (Butin, 2010). The amplitude of disciplines that make use of service-learning has given rise to several definitions ranging from a pedagogical instrument and methodology (Mtawa, 2019) to those that highlight the role of community and institutions, and furthermore ones that bridge the gap between theory and practice (Hardin *et al.*, 2006).

This study employs two service-learning definitions. The first one, proposed by Mtawa (2019, p. 9) defines it as:

> A pedagogical approach and a sub-set of the public mission of universities through which staff and students and external communities establish sustainable partnerships and participate in activities that empower them, develop their capabilities and functioning, and enhance their individual and collective well-being and agency as academicians, students and community members. This context includes sustainability, participation, empowerment, capabilities, functioning, well-being, agency key components and outcomes of CSL [community service-learning].

Adding to this, a widely cited definition by Bringle and Hatcher (1996, p. 222) propose service-learning as

> A credit-bearing educational experience in which students participate in an organized service activity that meets identified community needs and reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline and an enhanced sense of civic responsibility. Unlike extracurricular voluntary service, service-learning is a course-based service experience that produces the best outcomes when meaningful service activities are related to course material.

Service-learning is often closely linked to other pedagogical experiences like design-build, public interest design and others in a discipline like architecture. "The inherently transversal approach of design-build pedagogy affords it a unique position vis-a-vis the discipline of architecture, institutions of higher learning, and broader publics." (Nicholas and Oak, 2020). Such an articulation is a model in architecture precisely because it attempts to balance service and the learning experience and link them in a meaningful way, putting community engagement at the center of the experience for future practitioners.

Service-learning in the architecture discipline must create a new relationship between academic and community partners in which the contributions of both partners are understood and valued. When this co-learning is achieved, valuable outcomes for both academic and community partners are possible. In the practicing professions, emphasis is often placed on "getting things done." This too often leaves little time for reflection on what has occurred and what has been learned.

Inspired by the civil rights movements of the 60s, architects, designers and urban planners on urban campuses pressured their academic institutions to be more responsive to the

communities hosting them (Angotti *et al.*, 2011). Community-design centers began to appear, and a growing number of design and planning programs began to incorporate service into their curricula. However, the neoliberalism of the 80s saw many of these programs disappear. Semester-long courses rarely meshed with community timetables. In addition, universities "often failed to recognize engaged, community-based scholarship when evaluating faculty for promotion and tenure."

Architecture is not the only discipline engaging with community-based design and service-learning programs. In a broader sense, advocacy planning and public-interest design (Abendroth and Bell, 2015) grew out of these community design movements. Both challenge the assumption that merely changing the built environment can bring about social change. Advocacy is the foundation of the contemporary field of progressive community planning (Angotti, 2008) it integrates the knowledge of other fields and highlights the influential contributions of women, feminism, the indigenous and other vulnerable groups to communities' profound social and physical transformations. Progressive community planning seeks to achieve local and global equality, social inclusion and environmental justice.

Contrasting to other approaches like edutainment (Pojani and Rocco, 2020) such as serious gaming and role playing (Olesen, 2018), service-learning provided a way for students to able to "access" the site remotely and reframe preconceptions of the site, specially relating to stigma that might be present when approaching an informal settlement for the first time. While serious gaming and role playing encourage accommodation, motivation and situated learning, service-learning (Mouaheb *et al.*, 2012) though conducted remotely, allowed students to be closer to the lived realities of the community members and design the ethnographic instruments to interact with participants. Consequently, as Pojani argues, service-learning allows dismantling the notion of informal settlements as "impenetrable or unknown to outsiders" (Pojani, 2019, p. 7).

This also concurs with what is argued by other authors, "even in settings in which online teaching predominates, one needs to look for ways to integrate some sort of physical (inter) action in order to significantly enhance learning" (Rooij *et al.*, 2020, p. 121). Rather than implementing, for example, role playing, through service-learning students attained certain closeness to the site via the online interaction with inhabitants. Furthermore, Salazar Ferro *et al.* (2020, p. 349) argue that "the best strategy for introducing the concept of participation lies in offering students the opportunity to directly interact with real clients and users". And they continue recognizing how "role-play exercises on their own are proven to be insufficient in developing students' sensibility and awareness of social issues" (Salazar Ferro *et al.*, 2020, p. 349).

Similarly, service-learning was chosen over other pedagogical approaches with more tradition in the architecture discipline, like live projects in the UK (Brown, 2012) or design build programs in the US (Hinson, 2007) because of the aforementioned Tec21 service academic requirement. The proximity and already established relationship between Tec de Monterrey and the informal settlement of Campana-Altamira, the delicate power dynamics and expectations of its inhabitants, and the lack of resources for the actual construction of projects all supported the decision of not choosing a design build or live project approach. Moreover, this service-learning academic experience builds on a body of research and experiences within Tecnologico de Monterrey that promote a "paradigm shift in architectural education from an object-to people-driven design" (Krstikj, 2021, p. 16).

Methodology and context

Research utilizing the case study methodology focuses on understanding a phenomenon in a real-world context (Yin, 2009). The method also provides a rich description and analysis of that case (Merriam and Tisdell, 2015). This case-study research design analyzed a particular

context to better understand the opportunities, challenges and implications of service-learning in informal urban settlements (Eisenhardt, 1989; Gerring, 2007).

The case-study approach for this experience was influenced by Butin (2010). By separating the "service" and "learning" components, we could unravel the implications for service-learning for informal communities (service) and isolate the lessons, challenges and opportunities for service-learning as a teaching methodology (learning). This permitted an in-depth analysis of service-learning in a complex urban setting with limited resources and during a specific course with time limits.

The study was guided by the following research questions:

RQ1. What are the opportunities and challenges of implementing service-learning experiences in online courses in informal urban settlements?

RQ2. What are the implications for teachers, students and the urban community members of implementing a service-learning approach in architecture courses?

Case study
Overview of service-learning in Mexico and tecnológico de monterrey
Service-learning has a long history in Mexico, linked to the social demands that emerged from the Mexican Revolution. In this case, we addressed the need to bring the university and its social benefits closer to the people. In 1936, the university social service was established with the first agreement between an agency of the public sector, formerly known as the Department of Public Health, and the UNAM National School of Medicine (Mazón Ramírez, 2010).

Social service became mandatory on November 17, 1942, with the amendment of Article 5 of the Mexican Federal Constitution, establishing that "professional services of a social nature will be compulsory and remunerated under the terms of the law and with the exceptions indicated by it" (United Mexican States, 1917). Nowadays, social service is understood as "work of a temporary nature executed and provided by professionals and students in the interest of society and the State" (Cámara de Diputados del H.Congreso de la Unión, 1945).

Social service is also a qualification requirement established in Article 24 of the General Education Law in Mexico. Every Mexican student at the professional level under the age of 60 must fulfill at least 480 h of social service.

In this context, Tecnologico de Monterrey is a private, non-profit, independent university founded in 1943 in Monterrey, Mexico. It now has 26 campuses throughout the country with more than 90,000 students and 9,500 professors. The work of all the campuses of Tecnologico de Monterrey is supported by civil associations all over the country who are committed to quality in higher education. Every year, the board members of these civil associations meet to define the goals that will guide the major decisions that will help the university meet its objective to drive the development of communities and the nation (Tecnologico de Monterrey, 2021a).

One way to accomplish this is through social service. The social commitment of Tec de Monterrey is ingrained in its Tec21 Educational Model; 78% of graduates perform more than 480 h of social service. On average, a student performs more than 560 h throughout his career (Tecnologico de Monterrey, 2021b).

While the citizenship learning aspects of social service have always been important, the launch of the TEC21 Educational Model increased emphasis on the learning experience of Social service. Social service-learning experiences in core courses are a requirement. Each degree has at least one such course, denominated a human sense course, where there is a collaboration with a teaching partner and a community to contribute to attaining at least one

of UNESCO's 17 Sustainable Development Goals. The benefit is twofold: engaging with communities and their real-life issues challenges students' skills and increases their discipline mastery while also contributing to the generation of proposals that strive to reduce or solve Mexico's problematic social issues.

The teaching partner in the Tec21 Educational Model is a person or entity from the manufacturing or services sector, government, civil society or community group with whom Tec establishes a long-term collaborative partnership to address various challenges. Students can get involved in these organizations' operation and management processes by solving real problems, called challenges, designated and designed to develop their skills. By communicating their organization's issues or real situations, the partners collaborate with professors and students, devoting time and resources to resolve the challenge according to agreed-upon terms.

The urban and institutional context: monterrey, La Campana-Altamira and tecnologico de monterrey

Monterrey, the third-largest city in Mexico, is consolidated as the country's industrial metropolis. The city is home to many prestigious public and private universities, multinational corporations and a large industrial hub that has transformed from textile, foundry and metallurgy to the automotive, aerospace, electrical appliance, logistics, plastic, steel, foundry and general manufacturing industries (Vizcaya, 2006). In 1890, Monterrey's steel foundry, glass, cement and beer industries, among others, were fiercely promoted. This led to the spread of worker neighborhoods in the vicinity of industrial plants, and the co-urbanization of the municipalities of Monterrey and San Nicolás de los Garza began. In this epoch, the industries proliferated, spontaneous worker housing areas multiplied, and residential areas planned by businessmen, who fulfilled the state's role of organizing the city, also sprouted. These factors increased the "asymmetry" between vigorous economic development and chaotic urban development (Aparicio Moreno *et al.*, 2011, p. 185).

In the 1960s in Monterrey, the Campana-Altamira community emerged due to the lack of accessible housing; people informally occupied this land on a hill with steep slopes surrounded by a water stream. This is prevalent in Latin America, where over 30% of cities are informal urban settlements (Leon Acosta, 2020). The community is near the city's center and primary roads (see Figure 1). Nonetheless, due to its complicated topography and irregular land-tenure status, accessibility in the area is restricted. It remains physically isolated from the rest of the city so that the quality of life of its 20,000 inhabitants is severely affected by limited access to resources and services. The effort needed to establish a human habitat under harsh conditions strengthened the community's social capital; its recognizable topography consolidated its identity.

Previous work on informal settlements in other regions of Mexico have explored the multidimensional and complex nature of the phenomenon in relation to concepts such as place-making in Veracruz (Lombard, 2014) and the impact of urban acupuncture or small-scale physical space interventions in an informal settlement in Mexico City (Lastra and Pojani, 2018). As it will be explored further throughout the contribution, service-learning proves a valuable opportunity for students to approach informal settlements and move past preconceptions of what informality means and what it entails. Fewer contributions have looked into the value of service-learning, both for communities and academia in informal settlements in the context of Mexico.

The case study presented here, Campana-Altamira is nestled between Distrito Tec and San Pedro Garza García, the wealthiest municipality in Mexico; however, the community's prime location has not stopped violence in this area. There is a stark socio-economic contrast between these areas, even though Campana-Altamira is within walking distance of Tecnologico de Monterrey, only 2 km apart. The community was stigmatized as insecure and

Monterrey Metropolitan Area

▢ Distrito Tec   ▲ Tecnologico de Monterrey   0   0.5   1 km
▢ Campana-Altamira
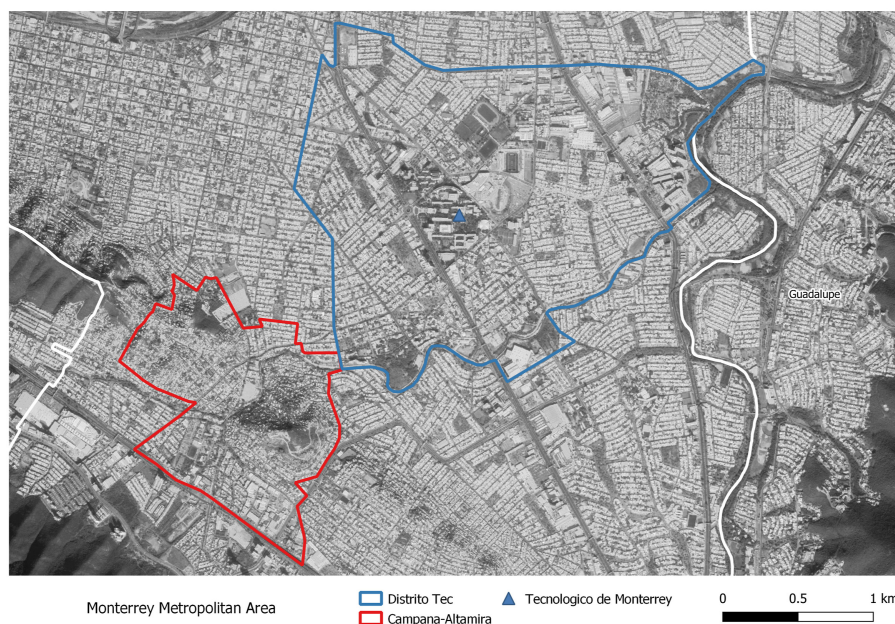
Figure 1.
Monterrey
Metropolitan Area.
Elaborated by the
authors

violent, a mark given during the violence surge in Monterrey from 2009 to 2016. The situation of violence throughout Monterrey during that period of drug cartel violence has been studied and documented, with little emphasis on its impact on Campana-Altamira. In fact, the case of Monterrey illustrates very clearly how violence in the country continuously shifts and spreads. In 2009 violence in the city, measured in homicide rates, began increasing "spectacularly" with up to a nine-fold increase in homicide rates in 2011, which doubled the national average (Villarreal, 2015).

The types of violence present during this escalation mainly were, but not exclusively, related to organized crime fights over a *plaza* (Villarreal, 2015) involving gang violence, kidnapping, executions and extortion, among others. These more visible manifestations of economic violence related to organized crime led to other types of urban violence, namely, assaults, robbery, property damage and widespread insecurity. During the height of the violence in Monterrey, drug cartels infiltrated the area of La Campana-Altamira, and the identity and social fabric of the community deteriorated. Many of its youth were lost or fled during this period.

The ubiquity of violence was so far-reaching that in 2010, violence directly affected Tecnologico de Monterrey when two students were killed in the vicinity of the campus. As a result, Distrito Tec, an initiative to improve communities neighboring the Tecnologico de Monterrey campus, was founded. An area of 452 hectares and 20 neighborhoods around the university campus was consolidated as a district, Distrito Tec, considering natural and urban limits.

Although Campana-Altamira is not within the geographic limits of Distrito Tec, in 2014, an interinstitutional public-private partnership including Monterrey's Municipal Government, CEMEX (an international maker and supplier of cement), and Tecnologico de Monterrey was founded to improve socio-economic development in this area. Since then, the community has been making itself visible and communicating its identity to the rest of the city, striving to distance itself from the still-existing stigma of Campana-Altamira as a violent

and insecure area. As part of an array of efforts to improve the community, *Colosal,* the largest collective urban mural in America, and other urban interventions, have sought to convey the aspirations and identity of La Campana's inhabitants.

Although the Covid-19 pandemic has impaired physical and social interactions, the impact has been different in this community. On the one hand, distrust of governmental authorities, past abuses suffered in medical institutions, low education levels and physical proximity of the settlement all compound a community currently interacting without much physical distancing. On the other hand, video conferencing, one of the tools to keep community engagement during the current pandemic, is difficult in this marginalized community where Internet connection is irregular. Internet service providers require proof of address via electrical or water bills, which many of these citizens lack. Nevertheless, social media like Facebook and WhatsApp are provided for free with the leading cell phone service providers in Mexico, so keeping up with the community through social media is easier.

Academic context: the service-learning approach in this experience
The experience occurs in the context of two courses, "Architecture and Contexts" and "Community Facilities," two mid-level core courses of the BA in Architecture under the Tec 21 Educational model at Tecnologico de Monterrey. Course design relied heavily on contextual immersion as a primary learning activity to generate an in-depth site analysis and a thorough understanding of the urban area. The second course, Community Facilities, is the humanities course for the Architecture BA program. The teaching partner selected for the subject was a university professor who was also the Community Liaison Specialist for the Urban Planning and Infrastructure Department of Tecnologico de Monterrey. His knowledge of the informal urban settlement of La Campana was profound, as he had been working on-site with the communities for over five years.

Both courses contain denser theoretical content than traditional design studies; they require 12 class hours and four teacher-supervised work hours. Although they are not designed as concatenated courses, working on the same site with the same professors and students comprises an integrated approach.

The learning objectives of the Architecture and Contexts course included detecting problems and needs with a critical and systemic view of available information; elaborating architectural programs by critically evaluating the user requirements for place, space, equipment and regulations; presenting alternative solutions to architectural problems based on systemic, critical thinking and a vision for the future; and applying research methodologies from a socio-environmental architectural perspective. Students should also demonstrate competency in integrating the needs of vulnerable groups with architectural and urban project solution proposals, adapting to contextual realities and ethnographic characteristics through citizen participation. The course orientation includes participatory design and diagnoses while solutions are being considered.

The five-week course was divided into two stages. In the first stage, students performed an urban site analysis based on secondary sources of data. In the second stage, students developed four ethnographic instruments to conduct a participatory diagnosis in the Luis Echeverria neighborhood, part of La Campana. These four instruments (interview, survey, mapping and auto-photography) were applied both asynchronously and online in collaboration with four community members.

The second course, Community Facilities, spanned 10 weeks and mainly dealt with design development and construction document phases using the information produced in the previous class. Learning objectives included integrating the needs of social groups in the solutions proposed by architectural, rural or urban projects; presenting architectural spaces that incorporate environmental, social, economic, cultural, technical and cognitive components with a systemic, prospective and participatory approach. Students also had to be able to

identify construction materials and procedures under life cycle criteria, sustainability principles, and the regulatory framework of each region; use construction systems identifying the technical requirements of the project and the context where it is applied, and prepare the executive project proposal based on the current regulatory framework.

In this case, students were asked to design a community center with a flexible typology. The specific program was based on the needs analysis of the La Campana community conducted in the previous course. This was a hypothetical and academic project without the intention of being built. However, the site was selected for its adjacent location to a public space with a seed fund assigned for a small urban intervention. Students produced a participatory-design workshop so the community could clarify their needs for this site. Both locations, called the academic site and the real-project site during the course, were connected by a pedestrian bridge and are shown in Figure 2.

This experience shows how service-learning can be articulated into public interest design and work as a detonator for community improvement and student learning.

Description of the service-learning experience
Students were not allowed to physically visit the Luis Echeverria neighborhood to circumvent the complications and restrictions imposed by the Covid 19 health contingency. The teaching team on the ground provided photographs, videos and other resources to help the students grasp the reality of Luis Echeverria and try to move them past prejudice they might have regarding the area. The four ethnographic instruments were designed with teaching team support and guided toward inhabitants' perceptions, uses and opinions of spaces in the neighborhood.

A *single survey* consisting of 33 questions was designed and applied to obtain general information regarding participants and the current needs within the community. Following
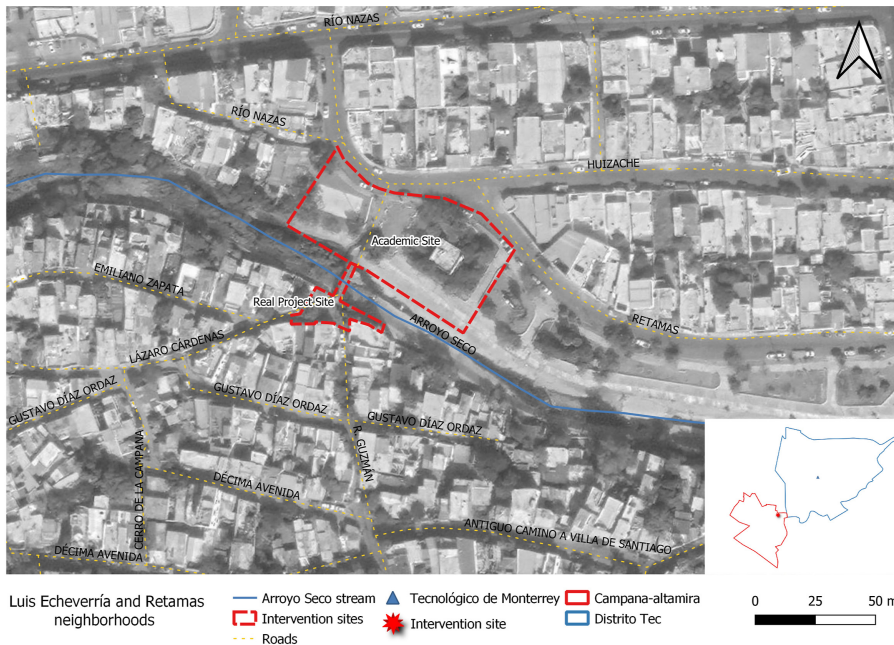
Figure 2.
North of the Arroyo Seco stream is the formal urbanization pattern of Retamas, a middle-class neighborhood. South of it is the Luis Echeverría neighborhood, part of Campana-Altamira

the survey, which was redacted in an online format, students designed an interview. The objective of the interview was to approach participants in an in-depth manner, listening and understanding the needs and areas of opportunity within the Luis Echeverria community. The *interview* included 19 open questions, which were categorized according to topics to be discussed with users, for example, time lived in the area and relations with neighbors and community. The interview was applied on Thursday, March 4, 2021, online simultaneously to four inhabitants of the neighborhood (Blanca, María Elena, Juan Manuel and Brenda).

The visual participatory methods, namely, *mapping and auto photography*, were applied remotely. For mapping, a large printed map of the community was shown to participants during the interview. There was also an online exercise to identify space categories, namely, favorite spaces, most commonly used areas in the community, problematic, uncomfortable or inaccessible areas and transit routes (streets). Lastly, *auto-photography* was conducted remotely, using WhatsApp to create a group with the neighbors of Luis Echeverria. The activity consisted of four photography requests per day illustrating specific themes of the urban spaces and their uses by inhabitants. Broadly, the categories defined public spaces typically visited, security, representation and culture and usual paths transited in the area. Results can be seen in Plate 1.

The goal of the exercise was to obtain a more complete semantic overview to understand the daily life, culture and urban spaces in Luis Echeverria and Campana. The instrument focused on the inhabitants' relationships as shown in images and their anthropological knowledge to understand aspects that must be considered for future interventions in the area. The auto photography exercise also illustrated the value of visual participatory methods conducted without physical visits to the site, in this case, using free apps, such as WhatsApp.

Regarding Covid-19 and sanitary contingency dynamics, the site visits and field observations revealed that despite the health authorities recommendations of social distancing and staying at home, the streets were busy and filled with people, even children, during school hours. This aligns with what several authors (United Nations Women, 2020) have found that the Covid-19 pandemic has dramatically impacted caregivers, women, children and overall households.

The exercise also sheds light on the disparities of the education strategy implemented in Mexico. While private schools implemented robust online learning programs, public schools transmitted their programs through public television and radio. Without caregivers to supervise their schoolwork, many children were left to their own devices.

Findings: opportunities and challenges for service-learning in informal urban settlements

The case study's findings focus on the implications for academia and informal urban settlements while answering our research questions. The first research question is: What are the opportunities and challenges of implementing service-learning experiences in online courses in informal urban settlements? We begin by discussing the opportunities.

Opportunities

Accepting diverse technology made it possible to adapt the course and the activities programmed due to an unprecedented health contingency (the Covid-19 pandemic confinements): students were not allowed to physically visit the site. The available technology, via cellphones and tablets, and the overall portability of artifacts enabled the interactions between students and community members to capture the complexity of the site analysis.

While service-learning might be highly organized from an academic standpoint, very little participatory design is tidy, for it is a dynamic social process. Negotiating and resolving the

Places where participants spend time

Places considered insecure

Places of representation

Places of transit

social frictions that arise from the process create social capital in academic and urban communities. However, the short and intense nature of the academic course runs at a different pace than what the community needs. Sensitivity to the nature of community engagement is one of the challenges and benefits of the project. Accepting flexibility in an already highly complex and fast-paced course is vital to productive interaction with communities.

Furthermore, the community was already very close-knit and held remarkable social capital. The community members know each other and often collaborate to resolve issues regarding maintenance and provision of services in the area. Thus, the course benefited from building on these relations, adding to the student experience the work in a community with tight social bonds and a strong sense of community identity. This is a defining trait of Campana-Altamira. Students valued this social capital. They noticed it was lacking in other places in Monterrey and discussed the conditions and underlying processes that generated it. This reversion in looking at an informal settlement and not stressing what it lacks but its assets had important equity implications for students. The experience built their ethical competency, flexibility and adaptability to different contexts and interactions. They learned to design effective and equitable collaborative processes with low-income communities, which ultimately offer the potential to enhance their empathy and recognition of the reality of others.

Overall, the community was receptive and open; participants were willing to engage in the activities, survey, interview, mapping and photography. The auto-photography exercise using WhatsApp, for example, was particularly fruitful, sharing daily pictures via group messaging. These photographs and the activity itself allowed students to interact with participants and glimpse their everyday experiences and their understanding of the spaces in the community. In the case of students, they could move past previous misconceptions regarding the area of Luis Echeverria.

Working within an existing institutional framework outside the university increases the possibilities of tangible positive impacts in the built environment. In this case, the Teaching Partner, also a member of the interinstitutional council, was a bridge. He had access to a seed fund for public space interventions. The site analysis from the "Architecture and Contexts" course and further insights from "Community Facilities" led to community discussion and action through a participatory design workshop. After the class concluded, some students were involved in this stage, with teachers acting as consultants and facilitators. Ultimately, the community self-organized around their prioritized needs.

This summarizes the main opportunities found in this experience. The main challenges encountered are discussed in the next section.

Challenges
One of the most difficult challenges from the teacher perspective is working with the time constraints of five and 10-week courses. Even though they were 16 h of synchronous work per week, the students had limited skill sets. The time was often not long enough for them to really internalize their new skills and knowledge naturally. Therefore, more teacher intervention and guidance than anticipated was necessary. Also, the courses comprised two classes of 23 students, 46 total, which, for online courses, presented challenges of individual interactions with community members. Moreover, interactions among team members and the social capital of the academic group were limited.

Although the site analysis achieved the desired depth and students understood the complexity of Campana-Altamira, the online modality presented difficulties in transmitting and capturing the whole experience of the place. For example, phenomenological aspects of the site were overlooked, such as immersive sounds and smells, since these are hardly grasped by video.

Another challenge was balancing content for students because the strong emphasis on ethnographic methods was unappealing for some. For teachers and facilitators,

communicating the importance or relevance of these methods as part of their disciplinary toolkit is part of the challenge of service-learning.

From a teaching perspective, there were other challenges. For example, aligning the courses' learning objectives with a service-learning approach required integrating course and service-learning goals into one framework. Even though the course objectives were already established, and students demonstrated understanding of how the service-learning experience added depth to their civic responsibilities, they were not always clear how it developed their skills as architects. Therefore, communicating how academic and service-learning goals are integrated is crucial for students' understanding of the experience.

The second research question regarding the implications for teachers, students and the urban community members of implementing a service-learning approach in architecture courses is discussed in the following section.

Implications of service-learning for teachers, students and urban community members

Teachers

Engaging in service-learning experiences requires more time investment from teachers than any regular course.

Returning to what Butin (2010, p. 3) proposed service-learning ought to do, the experience of the course in Luis Echeverría demonstrates its potential in architecture teaching, particularly regarding community diagnoses and site analyses. The activity fostered cognitive, affective and ethical student outcomes, led to a more active citizenry (of students, teachers and community members), reconnected universities with their local communities, and, overall, had the potential to promote a more equitable society (Butin, 2010, p. 3).

The responsibility of teachers to design guiding exercises that allow students to experience equity must be recognized. The collaboration of communities and students horizontally is not a given. It needs to be consciously designed and implemented.

Students

The experience enabled us to look critically into how service-learning allows students to "(1) participate in an organized service activity that meets identified community needs, and (2) reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility" (Bringle and Hatcher, 1996). Regarding "participation in an organized service activity," the students developed ethnographic methods to identify spatial, service-related and infrastructural needs in the community, a pre-requisite for meeting "identified community needs." Using surveys, interviews, mapping, and auto-photography, the students conducted an in-depth site analysis using technology to circumvent the restrictions of the Covid-19 health contingency. They approached the diagnosis from the community's experience, particular points of view, and needs.

While the courses had time constraints and specific content to be covered, they ultimately provided valuable lessons for future practitioners and allowed "reflect[ing] on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility." Further understanding of course content and ethnographic methods was achieved by applying the instruments designed during the course, reflecting on these methods from a disciplinary perspective, and using these to understand the social, political, environmental, cultural and spatial complexity of La Campana. All enhanced the students' sense of civic responsibility. Although site visits are an essential part of community diagnosis, the results suggested that

students would have a more nuanced comprehension of the context beyond physical aspects if adequate resources and guidance were provided.

The active engagement of both students and neighbors resulted in all students attaining the learning objectives of developing the competencies established for the course. The successful adaptation of this service-learning course to an online format suggests that students and neighbors highly value these educational experiences, even when facing difficulties. As argued by Butin (2010), the knowledge acquired from this course "embodies the connections and engagement desired between institutions of higher education and its local and global communities".

This is the first generation of architecture students under the new Tec21 education model, so there is no available data for a true comparison of the quality of student work with previous courses. Ethnographic work had not been approached with such intention and academic time afforded in the architecture degree at this university. Having established that, it is important to note that the design quality of the buildings proposed in Community Facilities is comparable to other design studios, it is neither improved nor negatively impacted by having afforded time to the service-learning approach. However, the programmatic decisions were better justified after getting to know the community through these methodologies. As Kamalipour (2016, p. 61) suggests: "understanding is a key condition for unravelling the capacities of informal settlements through analyzing the ways in which they work".

As professors, we observed more confidence and competence in justifying the architectural program.

Community members
The agency that is supposedly developed through the service-learning experience was not measured, although it was observed by stakeholders with more long-term community involvement. In fact, in this case study, the experience was positive. Willing engagement with community members was possible precisely because of the well-established public-private partnership via the Campana-Altamira Interinstitutional Council.

The importance of the maturity of the academic-community relationship maturity cannot be overlooked. Trust-building takes time and derives from past successes and the investment of resources from both sides. Once achieved, it can support fruitful collaboration between academic and local communities, overcoming time and resource constraints.

The course triggered other projects and interventions. The students' real-life participation with the placemaking project led to the improvement of specific problems in the community and works in progress.

Members of the community who have participated in these processes are noticeable and tend to engage more confidently in other participatory activities, taking on leadership roles. In our particular experience, we observed that service-learning empowered the community because the roles and responsibilities of stakeholders were transparent. Also noteworthy, in our case, all of these leadership roles were fulfilled by women, suggesting a gender equality impact.

Discussion
The value of service-learning for architecture education and for informal urban settlements
The structure for a service-learning approach is already given through the Tec21 Educational Model. It is a requirement, so the supporting elements of a teaching partner and working with a real-life problem are facilitated. A department managing the relationships between teaching partners and the university was created in the months after this service-learning experience.

It reduces the amount of time that teachers must invest in finding relevant partners. Also, it encourages longer-term commitments of five years by the university and teaching partners signing a collaboration contract.

The support of a long-term relationship is even more critical regarding the ties between the community and university; it benefits actors on both sides. When a solid trust foundation exists, the time traditionally invested in trust-building can be allotted to other participatory academic activities. Moreover, a teaching partner with a deep knowledge of the community can mitigate the risk of inequitable or abusive power dynamics toward it by sharing data already gathered through previous participatory exercises. The community is not a laboratory. In other words, the service-learning approach should ideally build on the teaching partners' long-term relationship with the community or strive to build one, and the university should advocate for the maintenance of the teaching partner in the community. Specific to this case study, Tecnologico de Monterrey has data bases that document these relationships between teaching partners and the locations where they work. Moreover, reports, diagnosis or information produced by the learning activity in which communities were involved should be returned to participants, for them to have access to the results of the service-learning exercises.

Communities
The fact that architecture is a practice-oriented discipline makes a service-learning approach particularly useful and relevant when there are supports in place, even when conducted online.

Vital factors for the successful implementation of service-learning in this experience were communication and transparency. In our experience in Luis Echeverria, the community had a clear understanding of roles. There was a transparency that the students were instrumental in attaining their goals, but they were in the project for a limited time. Also, there must be transparency and communication about community expectations and what can be achieved during the course duration.

A clear benefit of the experience, for students, is the "expansion" of the limits of the profession, i.e. expanding what students conceive that architects *do* and whom they *serve*. This has a twofold potential. First, students become more sensitive about the diversity of clients who might require their services. Second, architecture becomes more accessible to the general public. Mexico is a country where six of every 10 houses have been built without the technical assistance of an architect (Solera, 2017). Making students aware of this unattended market offers social and commercial benefits.

This service-learning experience based on ethnographic research could be consolidated as the model that bridges the gap between theory and practice. Comprehensive site analysis tends to be overwhelming, as it involves analysis and synthesis of a large amount of data. Interaction with the community becomes essential in navigating information, as the community relates the more relevant aspects that enable critical analysis of the site.

The service-learning framework provides an integrative approach that ultimately combines theory and practice at several levels.

Conclusions
Service-learning experiences offer students, institutions and communities a legitimate space where meaningful theory and practice combine.

One of the aspects that seemed difficult to achieve going into this experience from the teachers' and students' perspectives was developing a deep sensitivity for the site. Discovering in the students' reflections their sensitivity toward the messy/complex realities of community-based projects was, therefore, one of the most gratifying aspects of the

experience. Profound site awareness is possible, even without physical site visits, through an online service-learning modality. This could have overarching implications for some aspects of how the practice of architecture works. For example, in terms of some international architectural competitions which are done without actual site visits, online service-learning or collaborations between firms, universities and communities might be a lasting and more sustainable way of approaching these projects.

Another daunting issue is time constraints. The service aspects and community benefits of service-learning can take a lot longer than the course length. However, through inter-institutional community work, longer commitments elevate service-learning experiences from quick fixes to more fundamental systemic transformations.

Service-learning is an articulating interface that integrates theory and practice. It is a practical methodology for challenge-based and competency-based education. Reflective essays, class discussions and metacognitive aspects of the service-learning experience throughout the courses are vital in achieving the benefits of this approach. These should be incorporated into the course design to facilitate learning. Just as the community benefits and impacts can take longer than the allotted course time; learning extends beyond the course timeframe. As the students mature and increase their skills, attitudes and cognitive levels, they deepen the learning acquired through this experience.

Considering all that has been stated, the authors suggest that service-learning is beneficial for practice-oriented disciplines, such as architecture. These experiences are meaningful, inexpensive, accessible and easy to replicate after the initial time investment of trust-building is in place. The service-learning experience in Luis Echeverria was fruitful both to students and the community through the participatory site analysis and diagnosis, which were inexpensive and accessible as it was conducted remotely.

This exercise could be replicated in places where institutions or nongovernmental organizations are already working, though not exclusively. For example, in this case, pre-existing *social capital* in the informal urban settlement allowed us to access the community through context-appropriate networks. This could be replicated in other places if a more extended timeframe to become acquainted and build trust is considered. It is crucial to manage time appropriately and keep in mind course contents and schedules in this stage.

More formal evaluation of service-learning outcomes is needed, both the impact of service in the community and the academic aspects of the students' learning. For example, on the one hand, a follow up qualitative study could analyze and evaluate the benefits for students in terms of metacognition, achievement of sub-competencies and civic engagement. On the other hand, since community partners are stakeholders, there is a need for studies examining their experiences, needs and perceived benefits from service-learning.

Given the rapid pace of worldwide urbanization and the ubiquity of informal urban settlements, flexible and sensitive approaches that put communities in the center become critical to identify and understand their needs and improve their contexts.

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