Engagement in Practice: Addressing Redlining in Introductory Civil Engineering Courses

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Abstract

Redlining is the practice of systemic disinvestment of resources and services from residents of certain communities based on race and ethnicity. Even after the passage of the Fair Housing Act of 1968, the effects of redlining persist in the form of substandard infrastructure and services in areas that were redlined. In Fall 2022 and Spring 2023, the issue of redlining was used in two first year civil engineering courses to highlight the role of civil engineers in addressing societal issues. In our first semester, first year course (CIVE 101 Introduction to Civil Engineering), redlining was addressed as an example of how policies affect not only social justice issues but also how and where infrastructure is delivered. Building on this introduction to redlining, our second semester first year course (CIVE 102 Geomatics for Civil Engineers) course incorporated work for the Omaha Spatial Justice Project by digitizing georeferenced images from 1955 to help quantify what was lost in redlined areas of Omaha, Nebraska when US Highway 75 was constructed. Students in both classes reflected on why understanding redlining and other social justice issues are important to their future careers as civil engineers. This paper describes what was done in both classes and reflections from both students and instructors.

Introduction

Service-learning and community-based learning are proven pedagogical approaches used across multiple disciplines and educational levels to bridge teaching and community engagement (Billig, 2000; Kuh, 2008). Over the course of decades, research demonstrates the benefits of service-learning (SL) to student learning (Warren, 2012), satisfaction (Drinkard & Tontodonato, 2019), engagement, and retention (Bringle, Hatcher & Muthiah, 2010). This paper describes how information on redlining was incorporated into a service-learning project for a social justice organization in a series of two first-year civil engineering courses at the University of Nebraska.

The University of Nebraska-Lincoln's Department of Civil and Environmental Engineering offers one program of civil engineering delivered on both the University of Nebraska – Lincoln (UNL) and the University of Nebraska Omaha (UNO) campuses. The courses described in this paper were taught on the UNO campus in Fall 2022 and Spring 2023. UNL has a community engagement program and UNO has a service-learning program, the Service Learning Academy. The mission of the UNO Service Learning Academy is to facilitate "university and community-wide partnerships, develop and collaborate on community-based research, and support rigorous service learning courses in pursuit of UNO's metropolitan mission to transform and improve the quality of life locally, nationally, and globally" (University of Nebraska Omaha, n.d.). The Service Learning Academy at UNO works to support faculty to develop service-learning courses in collaboration with community organizations, governmental agencies, and businesses. The Service Learning Academy has a director and several full-time staff dedicated to helping coordinate over 200 faculty-led service learning courses collaborating with over 300 community partners and over 75 different Omaha-area schools.

The service-learning project incorporated into these two civil engineering first year courses involved an evaluation of redlining in the City of Omaha, Nebraska. Redlining is the practice of systemic disinvestment of resources and services from residents of certain communities based on race. In the era of the New Deal, bank lenders, insurers, and government agencies—but most notably the Home Owners'

Loan Corporation—would draw red lines on maps to indicate neighborhoods with minority occupants, deeming them “high-risk for mortgage lenders." In these "redlined" neighborhoods, residents were refused loans, subjected to predatory lending with unfavorable terms, and denied financial services. Even though redlining became an illegal practice in 1968, the systemic ramifications of redlining are still present. This means that redlining practices of the past continue to impact historically redlined communities today.

Redlining occurred in most American cities including Omaha, Nebraska. The 1935 Omaha Home Owner Loan Corporation map (Figure 1) designated neighborhoods in North and South Omaha as yellow and red, while neighborhoods in West Omaha are designated green.

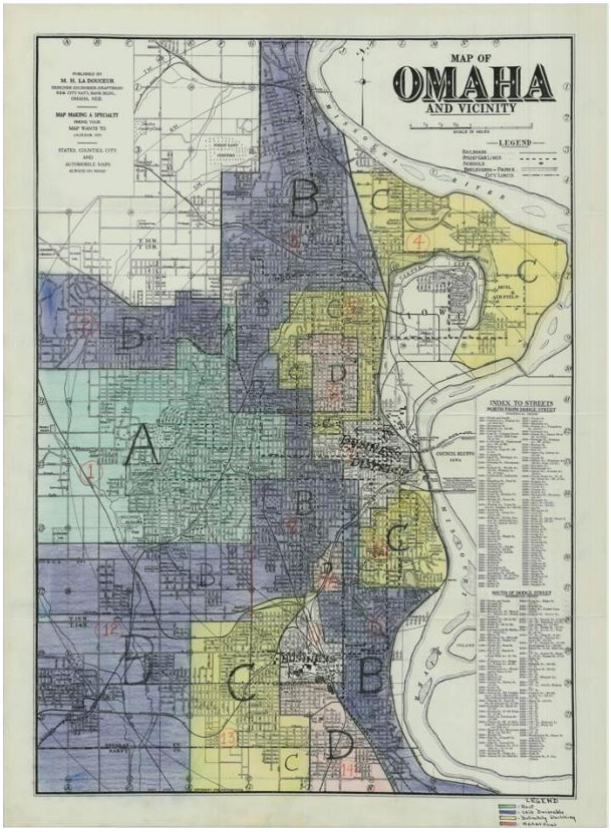

Figure 1. Redlined map of Omaha, Nebraska (Home Owners’ Loan Corporation, 1935)

The topic of redlining was introduced in a series of introductory courses to help students understand from of the beginning of their education as a civil engineer about both positive and negative consequences to society that civil engineers can have. We believed this was an important topic to introduce early in the curriculum so that students can learn to identify these types of negative impacts early in their education.

CIVE 101 Introduction to Civil Engineering Course

In the first semester, first year course, CIVE 101 Introduction to Civil Engineering, students were introduced to the concept of redlining and service-learning through several different activities. Service-learning was introduced through canvas modules that included the following information for students.

> “This is a service-learning course, which means you will be actively engaged with the community to meet your requirements for this course. Service-learning projects represent mutually beneficial partnerships between academic courses and community organizations where you will get real world contexts for practicing the skills taught in the class, and you will provide valuable services for the organizations services for which they could not afford to pay and which might otherwise go undone. All parties have an equal stake in the success of these projects. Throughout the course you will be connecting course content to your community experiences and reflecting on those experiences through a variety of medium. It is expected that you will treat your community-based experiences just as seriously and with the same level of quality and enthusiasm as the work we are doing in the classroom” (Hunt, 2022; Hunt & Jones, 2023).

The UNO Service Learning Academy staff presented to the students on the topic of service learning. Other course activities included a class presentation by Terri Crawford, JD, a Service Learning Fellow, and instructor in Black Studies at UNO, who introduced the topic and spoke with the students about the history of redlining in general, as well as the specific history of redlining in Omaha. One of the

significant impacts of redlining in Omaha was the communities and neighborhoods that were displaced during the construction of US Highway 75. The U. S. Department of Transportation estimates more than 475,000 households and more than a million people were displaced nationwide because of the federal roadway construction and the City of Omaha was no exception. In 1954 that the State of Nebraska and the City of Omaha proposed a $2. 5-million north-south expressway through the oldest parts of Omaha, including all North Omaha (Fletcher, 2020). Proposed as an economic development project, the North Freeway was intended to speed cattle to the Omaha Stockyard. Targeting the Near North Side neighborhood, the new freeway was planned to cut through historic black and poor neighborhoods. Construction was nearly completed by 1963. In 1977 the City of Omaha announced plans to extend the highway and as late as 1981 an additional 57 housing units were demolished to make way for an extension to the highway. In total, more than 2,000 homes, churches, businesses, and other buildings were demolished over 34 years of construction.

As a final course activity to prepare the students for their redlining service-learning project in the next course, the students took a guided tour of an interactive learning exhibit called "Undesign The Redline" (University of Nebraska Omaha, 2022), which was located on campus. The curriculum first explores social, historical, environmental, and economic challenges through the lens of UnDesign The RedLine (designing the WE, 2015). UnDesign the RedLine explores the history of structural racism and inequality, how these designs compounded each other from 1938 Redlining maps until today and travels nationally to cities, towns, and communities. The traveling exhibit invites participants to learn the history, interact with the stories and invent the future of undoing structural inequities. The students wrote reflections on their experience, and the reflections indicated the success of the course in that students' reported that they were happy to learn about this topic, that they were not previously aware of it, and that in the future, they would create designs to address the problems created by redlining in the future.

CIVE 102 Geomatics for Civil Engineers

CIVE 102 Geomatics for Civil Engineers is a course where the first two-thirds introduce students to geographic information systems (GIS) through a series of lab exercises. The GIS portion of the course concludes with a project. In 2023, the project focused on using GIS to help better understand the impact of redlining. GIS licensing was provided to the students at no cost.

In the spring 2023 semester, most students from CIVE 101 in the fall semester took the next course in the sequence, CIVE 102. As part of the course, a discussion on redlining was included to reinforce the learning for students from the previous semester and to provide students not in the previous semester with the needed background on redlining. Then the instructors lectured on the design and construction of US Highway 75 and how that affected people in the area of the highway construction. This led to a wider discussion of how civil engineers didn't develop redlining yet still allowed it to affect people's lives. Also included in the discussion was the importance of identifying stakeholders and carefully listening to all stakeholders as part of civil engineering projects. Finally, students were left with a quote from Maya Angelou "I did then what I knew how to do. Now that I know better, I do better." with the hope of the instructors that these civil engineering will do better.

To develop the service-learning project for CIVE 102 the UNO Service Learning Academy introduced the CIVE 102 instructors to two organizations, Spark and Fabric Lab. Spark is a community development intermediary and catalyst for transformation by promoting and investing in projects that enhance the core neighborhood assets that support stable, healthy communities across the Omaha/ Council Bluffs region. Spark links private investors to local economic development opportunities by leveraging our specialized

knowledge of the area, providing gap funding resources, and developing community relationships to help structure deals that have both financial returns for investors and social and economic benefits for area residents.

Fabric Lab is one of Spark's initiatives in their development area. From Spark's website, "Fabric Lab is a Black-led, multi-modal, intergenerational urban design lab, community hub, and access point that centers and supports Black spatial practitioners (architects, planners, creatives, and cultural entrepreneurs). Fabric Lab's goal is to serve as a community space for informing and shaping the growth and development happening in North Omaha" (Spark, 2022).

The student service-learning project in CIVE 102 was requested by Spark. Spark was interested in researching the buildings and parcels that existed in North Omaha prior to the building of US Highway 75. While the general area and number of buildings that were removed to make way for the highway were known, to date, there has not been an exact map or electronic shapefile created of the areas. A shapefile of the buildings in the area would be helpful in determining area, number, location, and count of buildings. As part of a class project, the students digitized the buildings from an aerial photograph taken of the area in 1955. The current buildings in the same area have already been digitized. Differences can be easily investigated from the two files. Each student was assigned an area of buildings to digitize. All the student work was then compiled and verified by the instructors before delivering the final shapefile to Spark and Fabric Lab.

The deliverable that Spark received was a GIS shapefile of digitized building footprints based on the 1955 aerial photograph (Figure 2a). Then, by turning off the 1955 background and turning on the present day aerial photograph, all the buildings that had to be demolished in order to build US Highway 75 can easily be seen (Figure 2b).

Student Perspectives

At the end of the project in CIVE 102, students were asked to reflect on their experience with the redlining exercises and service-learning project for Spark. Below are some of the reflections from students in the course.

> I learned that when Highway 75 was built, it meant many houses and businesses had to be destroyed. This separated communities and decreased the value of the properties because it's by a noisy highway. I saw through this lab first hand some of the houses that used to be where Highway 75 now is. In CIVE 101, I learned more in depth how the highway being built there affected the community and reinforce the consequences of redlining from the presenter who came and talked about redlining, and the exhibit we went to on Dodge Campus. This matters because redlining is an unfortunate truth about our city's history, and it still affects the city, and the people in the city, today.
>
> It matters to me as a civil engineer because as a civil engineer, it is my job to uphold the ethics that we are held to and consider how the projects we are working on affect people. Civil engineers were involved in every step of designing and planning Highway 75, and should have considered the consequences it would have had on North Omaha and the black community that primarily makes up its residents. I can learn from this project so I will hopefully not make similar mistakes and will be more thoughtful of the consequences of my projects when I am a civil engineer.

I was able to learn about this from visiting the redlining exhibit in CIVE 101 and the presentation on this project in CIVE 102. While the implications of Highway 75 were not able to be seen immediately, there was a large impact on the culture and community. As a future civil engineer, I will make sure to look at the long-term impacts of the projects I complete. I will use this information to minimize the negative impact my projects have on the public. My goal is to finish every project leaving a positive impact on the community effected rather than a negative one as seen with the Highway 75 project.

While not all the student comments were as developed as the ones above, overall, the project seemed to be well received by the students with no negative comments.

(a) (b)

Figure 2. Digitized buildings from project (a) Digitized buildings over the 1955 aerial, and (b) Digitized buildings over the present-day aerial

Conclusion

The redlining service-learning project spanned two semesters of the first-year curriculum for civil engineering students at UNL on the Omaha campus. The exercises and project were well received by students. This is a project that could be replicated for other urban areas with a redlining history. The instructors plan to maintain the relationship with Spark and Fabric Lab for future classes. The topics and methodology can be repeated for other cities, but local partnerships would need to be identified to maximize the benefits to the local communities.

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