Prospectus

Bridge Rehabilitation/Replacement using Accelerated Bridge Construction Methods

(Technical Report)

Effects of Place-Making on Contemplative Collaboration

(STS Research Paper)

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Fall, 2019

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I. Introduction

Urbanization of the built environment has the potential to create either positive or negative technological and societal impacts. Productivity and growth have been glorified in recent decades, with a notable decrease in contemplation. This absence of effective contemplation and mindfulness can lead to several undesirable outcomes, including a lack of attention to detail, decreases in productivity and the inability to productively collaborate.

The technical portion of this prospectus will focus on rehabilitation/replacement of the bridge over Ivy Creek on Route 250, given the potential for use of accelerated bridge construction (ABC) methods. Attention to detail and thus mindfulness will be crucial when deciding which form of design and construction should be utilized, and the societal implications of ABC should be considered. ABC is a bridge construction method that reduces onsite construction time through the use of contemporary construction methods, design, materials and planning. The social implications of ABC are arguably as important as the technical results; ABC can result in significantly decreased social impacts of construction. Traffic, detours, labor required and work-zone safety are a few factors that will come into play.

The sociotechnical portion of this prospectus will analyze the use of placemaking to facilitate contemplative collaboration.

My STS research group has been tasked with compiling/analyzing existing data, interviewing students at UVA, and even reaching out to graduate school students in China to determine the values that this new Contemplative Sciences Center should ideally encompass.

It will concentrate on providing the optimal design of infrastructure to inspire contemplation and collaboration. In creating this contemplative collaborative space we must pay attention to the social dynamics, physical elements, and individual wellbeing, as space is never neutral. Such design may utilize options including a biophilic environment, large, open spaces and natural light. Contemplative practices are crucial as they form a student into a better collaborator. They encourage students to be confident in expressing their ideas, to listen more and to embrace diversity. Collaboration is another vital component of growth, providing effects ranging from building strong teams to developing powerful communication skills. David Germano, the Executive Director of the Contemplative Sciences Center at the University of Virginia, has asked for student assistance with the design of the new Contemplative Sciences Center at the University of Virginia. The effective placemaking features identified throughout this prospectus should be taken into consideration for the design of the new Contemplative Sciences Center.

II. Technical Topic: Bridge Rehabilitation/Replacement using Accelerated Bridge Construction Methods

My technical project is loosely coupled with my STS research through the importance of the effects that the built environment has on people. The goal of my technical project is to provide the most technically and socially just option for the rehabilitation/replacement of the bridge over Ivy Creek on Route 250. Typically, construction or rehabilitation of a bridge is a particularly time intensive and inconvenient process for both construction companies and community members. Accelerated bridge construction (ABC) methods can be utilized to reduce the onsite

construction time, leading to a variety of technological and social benefits. This type of construction involves the majority of the bridge being built off-site, then transported to the site for a reduced onsite construction time. Extended construction projects impact mobility in two distinct ways: the flow of the transportation network and the safety of the traveling public. ABC improves site constructability, total project delivery time, and work-zone safety for the traveling public. With reference to conventional bridge construction, site constructability typically involves long detours, expensive use of a temporary structure, limited periods available for construction, and potentially remote site locations. ABC methods can provide a more practical, economical and socially accepted solution. Total project delivery time and work-zone safety are simultaneously improved through the use of ABC due to the limited construction present at the actual project site. Furthermore, the use of ABC methods will reduce traffic impacts, onsite construction time, and weather-related time delays. ABC results in less backed-up traffic and no need to identify detours for community members. Since the onsite construction time is reduced, ABC involves fewer working hours and less labor is needed. Also, it becomes far less likely that weather-related issues will cause significant time delays in construction. Lastly, ABC results in improved quality and durability, with lessened environmental impacts (U.S. Department of Transportation Federal Highway Administration, 2019).

Due to the aforementioned benefits, my capstone group will focus on the use of ABC construction for the construction of the bridge over Ivy Creek on Route 250. Although standard ABC is likely the most suitable solution in this case, we will also simultaneously be developing project alternatives in the case of failure/other unforeseen issues with the use of standard ABC methods. We will develop these alternatives based on the availability of resources needed for various types of ABC construction. For example, we will be determining if there is enough land for a construction yard near the project site, or if everything needs to be prefabricated. Further, in the case that everything must come prefabricated, what prefabricators are in close proximity to the project site and what are their capabilities? Factors such as these will assist us in deciding the available options we have when it comes to ABC methods. We then plan to perform a cost benefit analysis for ABC as compared to traditional construction methods. Lastly, we plan to analyze the components of design prior to completion: superstructure, substructure, cost and constructability.

One challenge specific to this technical project that we have encountered is difficulty in weighing factors such as time, safety and mobility. Additionally, it is challenging to distinguish and gauge the relative benefits of the various iterations of ABC.

After taking the previous factors and information into consideration, the primary goal of my technical project will be to identify the best construction method for the bridge over Ivy Creek on Route 250.

III. STS Topic: Effects of Place-Making on Contemplative Collaboration

Introduction

Students enrolled in the University of Virginia are becoming increasingly stressed, likely resulting from the fast-paced academic lifestyle. “The number of UVa students seeking

appointments at the university's office of Counseling and Psychological Services, also known as CAPS, rose 25 percent in the past year, said Dr. Chris Holstege, executive director of student health. That's following a steady 19 percent increase over the past 10 years, with appointments outpacing student growth" (Quizon, 2016). The overwhelming presence of mental health issues causes an increased need for students to develop qualities like mindfulness, compassion and equanimity as these qualities are helpful in combating mental health issues.

Although the topic is not commonly discussed, the environment we surround ourselves with has profound impacts on every part of our lives including our health (mental, physical, emotional and social) and our success (by influencing productivity, attention span, etc). The University of Virginia School of Architecture is currently collaborating with the Contemplative Sciences Center and the Center for Design and Health to explore the effects that both the built and natural environment have on mental, physical, social and emotional health of students. Proper design in different contexts is being considered, in an effort to foster contemplative awareness. The design of the new Contemplative Sciences Center, lead by David Germano, aims to encompass these values such as inclusivity, improving well-being, and fostering collaboration. Mr. Germano has identified a significant issue with the plan: the problem is currently being defined primarily by staff (professors, faculty), and students have not been consulted despite being the majority population stakeholders (Figure 1).

Through these processes, I have developed a question that will predominate my research: how can physical elements of placemaking be utilized to facilitate contemplation and collaboration?

Literature Review

Placemaking literature

An important component to consider in physical design is biophilia. Biophilia involves the human tendency to desire to be closely associated with other forms of nature, such as plants. Biophilic experiences like incorporating more natural sunlight, beautifying surrounding vegetation, and including potted plants in classrooms, can reduce stress, improve cognitive function, and enhance mood and creativity. These and other outcomes can increase health and wellbeing, as well as productivity (Browning, 2018).

Contemplation and Collaboration Literature

Wolfgang Lukas, founder of the Contemplative Scientific Collaboration initiative, described collaboration as "abundant in nature and indispensable in human culture." During a talk he gave at the International Conference of Mindfulness in 2019, Lukas asserted that researchers face significant impediments due to a lack of collaboration. These impediments include overly competitive environments and an apparent scarcity of resources, manpower, expertise and visibility. Thus, when provided with the proper environment and resources, researchers will flourish both contemplatively and collaboratively (Lukas, 2017).

Maia Duerr details the importance of creating physical spaces for contemplation, meditation, and community bonding in her piece *Creating the Contemplative Organization: Lessons from the Field.* Duerr uses employees at a company called Sounds True as examples to support her claim. This company offers group meditations in a designated meditation room. One woman working in the customer service department used this meditation room to prepare for a stressful

meeting. She said that it "helped her to remain calm and to remember everything she needed to say." This woman emphasized the significance of creating rooms like this, even if an employee rarely uses it. She stated that "simply providing a space that's available for reflection shows caring on the part of the company leadership." In addition to rooms solely dedicated to meditation or quiet time, she asserts the importance of spaces where contemplation and collaboration can spontaneously emerge. Duerr describes the use of an "altar," where employees can share photos of family, friends, loved ones, hobbies, etc. (Duerr, 2004). This idea could be translated to a large bulletin/white board in the Contemplative Sciences Center, perhaps with daily prompts/questions students could reflect on publicly. This helps to build a sense of community and provides a way for people to share symbols of what is important in their life, both in and outside of the University. Sounds True also provides an office gym, and employees are huge fans. "Sounds True supports people by allowing us to have the space for the gym. It's not just about spiritual products and meditation, but the bigger picture of taking care of yourself in all ways. I think the gym is an extension of that" (Duerr, 2004).

Although the provided literature offers insight into the potential uses of the physical elements of placemaking to facilitate contemplation and collaboration, these practices do not guarantee the spaces will be used as intended. Through my research described in "Methods and existing information," I aim to gain a more concrete understanding of the factors influencing varying uses of classrooms and contemplative spaces.

Framework

Placemaking involves the exploration of these variables. I intend to apply the Social Construction of Technology (SCOT) framework to my research. SCOT is the most appropriate framework to apply to my research for several reasons. Technologies and spaces have different uses in different regions and contexts. Technology and space are not value neutral and there are social variables involved in constructing forms of technology and physical elements. SCOT will prove immensely useful in dissecting these social interests involved in physical elements of placemaking. The social construction of space involves two primary processes: 1) the social process of constructing the collaborative contemplative space based on stakeholder needs and 2) the process of physical space shaping the interaction among social groups that share the space. For my research, the relevant stakeholders involved in the social construction of space will be primarily students and faculty. Interactions between students, faculty, and students and faculty will be studied. The use of SCOT in my research was motivated by reading Chapter 9 of *An Introduction to Science and Technology Studies*, regarding the design of the safety bicycle. This work asserts that there is "interpretive flexibility" involved in the design of technology and space. For instance, in one early design iteration of the safety bike, young male riders formed a relevant social group that was displeased with the design. "Their goals were not met by the safety bicycle, as its meaning (to them) did not correspond well to their understanding of a quality bicycle" (Sismondo, 2010). This idea of interpretive flexibility as well as relevant social groups being considered is crucial to my research methods.

In my future investigation I will study 2 cases of existing spaces at UVA. The two locations I will be comparing/contrasting are the University of Virginia School of Nursing and the current classroom that my STS 4500 class is held in (Mech 339). Both of these spaces are intended to be used for contemplative collaborative exercise, however, the outcome is drastically different; the social dynamics vary based on physical setting. The design of the UVA School of Nursing is

effective in creating opportunities for contemplation and collaboration, whereas the design of Mech 339 seemingly has the opposite effect. I plan to observe the interactions between users of these spaces, as well as interview at least 5 users from each space.

Methods and existing information

I will use these techniques to collect data so that I can understand "these variables" in my own project location.

In a preliminary interview, in an attempt to be mindful of a variety of opinions and demographics, we reached out to faculty and students at UVA as well as to Chinese graduate students that we had been paired with. We asked each stakeholder to describe an environment they believed would facilitate contemplation and collaboration. A faculty/staff member gave the following statement: "You can't force contemplation but you can create conditions for it… create multi-use spaces that are inclusive (gender neutral bathrooms) ...adhere to ADA standards and universal design spaces. No fluorescent lighting. Provide for the possibility of natural light but not distracting." Some key points from outreach done with UVA students are as follows: a collaborative space that is judgement free, open spaces, natural light, and opportunities for privacy if need be. My Chinese partner, Chelsea, also offered insights. She hopes that the center would have a "quiet environment and comfortable seats," a large room with several independent spaces inside, appropriate light and music, and a convenient closing time. We will incorporate the values highlighted by these various groups in our recommendation for the new Contemplative Sciences Center.

To assist in determining how physical elements of placemaking can be utilized effectively I will be conducting physical and participatory observation through interviews and site visits. Interviews with UVA students will be conducted to collect user perception of space. I will visit the UVA School of Nursing on 3 separate occasions and observe how students interact with the space. I plan to interview at least 5 users. I will also cite our current STS 4500 classroom as a space that is ineffective, based on my own personal experiences, participatory observation and interviewing 5 classmates/users.

Further, I plan to interview the following faculty members: Tim Davis, Lyndsay Alexander and Robin Albertson-Wren. Tim Davis is currently the Executive Director for Resilience & Leadership Development and was previously the Director of the UVA Center for Counseling & Psychological Services. Lyndsay Alexander is the Director of Strategic and Student Flourishing Initiatives. Robin Albertson-Wren is a contemplative practice instructor with CSC. I plan to discuss how they have noticed how spaces shape interaction with students and receive recommendations for a well-designed contemplative collaborative space. I also aim to interview students from my own STS 4500 course regarding the physical environment of the classroom, as well as the students from site visits.

When conducting participatory observation, I will be observing both individual activity as well as the interactions between students. I will document the pieces of the physical environment that appear to be contributing to effective contemplative contemplation, such as the layout of study tables in which the most communication is occurring. These methods will help me collect data

that will assist me in answering my research question through gathering concrete evidence supporting the use of particular physical designs.

Discussion and Next Steps

To reiterate and summarize my research findings, the following placemaking elements should be incorporated to facilitate contemplation and collaboration: open spaces, quiet spaces, natural light, biophilia, options for privacy, comfortable working environment (tables, seats, etc.), inclusivity (gender neutral bathrooms), a "hub" where members can connect, and a gym/recreation space.

Despite the overwhelming benefits of the strategies discussed, this transition to a more contemplative, collaborative environment will not be without challenges. For instance, the means needed to facilitate contemplation and collaboration will vary on an individual basis. Diversity and inclusivity are central values relating to the design of the new Contemplative Sciences Center, but we must determine how to truly quantify these metrics. Additionally, introducing contemplative practices into the workplace may cause conflicts, as contemplation inherently causes underlying issues and conflicts to surface. If interpersonal relationships become uncomfortable or upsetting, people will need to take this opportunity to further contemplate how to address these issues. However, Duerr offers some words of encouragement. She claims that addressing these conflicts and focusing on their impact actually creates trust and provides a place for collaboration that would not have been possible if underlying tensions had lingered (Duerr, 2004). Regardless, this problem as well as other conflicts potentially created through contemplation and collaboration remain to be addressed. Through my research, I hope to identify solutions to these problems.

My research will be complete by March 2020. I aim to finish my faculty interviews by January, finish my case studies and participatory observation by February, and use March as a time for the synthesis of collected information.

IV. Figures

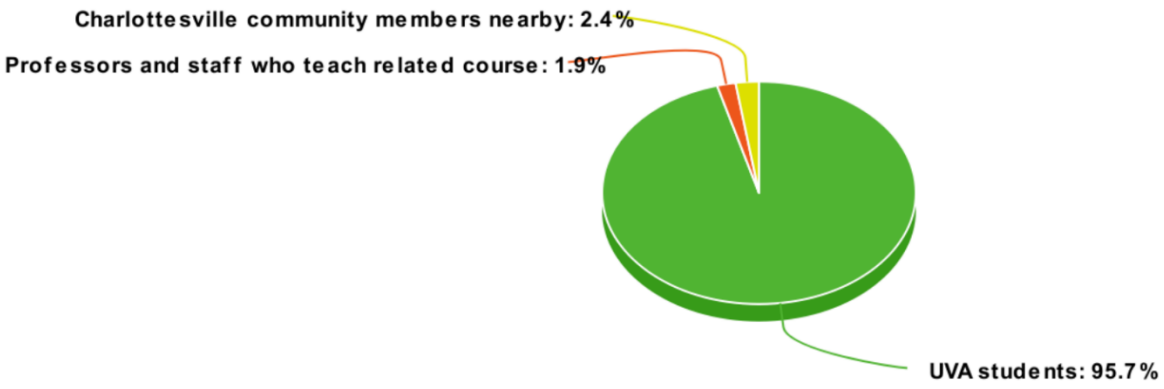

Figure 1. Stakeholder Distribution (Potential Users of CSC). Source: https://www.virginia.edu/facts, https://csc.virginia.edu

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