THE ART STAIRS

EGRS 451: Capstone Seminar
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Authors:
Megan Schmidt
Stephanie Roman
Tucker Emery
Casey Gibbons

Professor:
Benjamin Cohen

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INTRODUCTION

"Setting up a space that people don't want to just move through but actually want to spend time in, that makes perfect sense to me," remarks Nestor Gil in response to the concept design proposed by this year's 2016 Engineering Studies Capstone. The space Gil refers to is the system of stairs connecting Lafayette College's College Hill campus to North Third Street. These stairs have long been criticized, analyzed, and considered as a "problem" for the Lafayette and Easton communities, yet no satisfactory conclusion has been reached. Through our analysis of the problem and proposal of the "Art Stairs," we hope to provide a realistic and appealing solution to all those affected by the issues of commute.

The N. Third Street entrance to the stairs

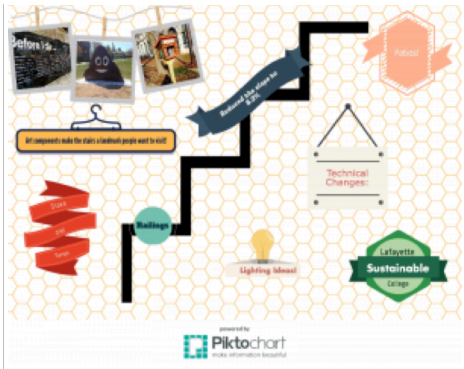
Through interviews with various stakeholders and literature reviews, it is apparent that the current commuting situation between the College Hill campus and downtown communities is considered a problem. According to a poll taken in October 2016, 58% of the 90 participants were "unsatisfied with the current commuting situation" (Emery et al., 2016). Through the Easton Matter's focus groups study, both the College Hill and Downtown neighborhoods identified traffic as it relates to walkability and safety as primary community concerns (Nurture Nature Center, 2016). The very fact that the campus is willing to invest 9.5 million dollars in an elevator connecting the William's Arts Campus to College Hill (Merlin, 2016) confirms the salience of the issue on an administrative level. Past projects in various departments including the Technology Clinic Report (2004), Michelle Oswald's Independent Study (2006), the Engineering Studies Capstone (2014), and the Civil Engineering Capstone (2016) indicate faculty and student investment in the problem. The four projects listed above are part of the long history of dialogue surrounding the stairs and must be analyzed in order to understand how the problem has evolved and where it stands today. Each project described the problem differently and therefore recommended a diverse range of solutions. The Tech Clinic report is similar to our own approach in its identification of physical and psychological components to the problem. However, the report goes further to assert that "There is currently little incentive for students to frequent the area due to the lack of useful commercial establishments" (Technology Clinic, 2004). At the time of this project, the William's Arts Campus was not yet established, with 248 North Third Street and Buck Hall not yet built. Today, the Arts Campus becomes one of these missing incentives. However, the majority of the student population

continues to see the stairs as too daunting of an obstacle for this incentive to be worthwhile unless they are taking a class (Student Survey, 2016). Considering this new development, the Tech Clinic's isolation of a lack of incentive oversimplifies the problem. The solutions proposed by the Tech Clinic proposes to address the physical components of the problem (the Funicular, the Elevator, and the Shuttle) also fail to address the psychological components of the problem, leaving 2 out of 3 issues addressed.

The Independent Study by Oswald analyzed the existing tours and transportation between College Hill and Third Street in order to provide recommendations to improve the accessibility for Lafayette College students, faculty and staff. Oswald fails to incorporate the town of Easton into her study, for they would benefit in this investigation. Her problem definition was based upon the idea that data collection, surveys and analysis were needed to gain the correct solution. This study focuses more on the environmental context of the whole problem, where our report wanted to expand past the technical fix. Oswald's solution consisted of a short term plan of maintenance, an extended shuttle loop and additional parking on Third Street. Maintenance activities included removal of weeds and debris and better lighting. Her long term plan focused on the technical fixes of topography, landscaping, railings and security cameras. Though her plan overlaps with our goals, it is just one of the problems we intend to fix.

The 2014 Engineering Studies Capstone states the problem definition in their introduction asserting that "The main problem that we are trying to tackle is to overcome the divide in the arts division from the rest of the campus by extending the college's community beyond the hilltop" (Chiles, Lucio, & Lomanto, 2014). While this problem definition aligns with our understanding of the problem, the suggested solutions fail to address the stated problem. They stress that their solution should emphasize "convenience", be "easily available", and be "safe" (Chiles, Lucio, & Lomanto, 2014), 3 issues that address a physical divide yet fail to further their goal of "extending the college's community beyond the hilltop." While the group ultimately recommends pursuing a stair renovation, the proposed changes are ultimately centered in a technical transformation and do not involve the community beyond the problem definition.

The 2016 Civil Engineering Capstone report offers a more technical understanding of the problem and solution and provides valuable data for further work. However, the report does not dwell on problem definition, acknowledge the role of community members, or address issues beyond the physical. The solution, which involves re-grading and adding steps throughout the stair system, emphasizes "safety, aesthetics, and the user experience" (Gill, Madden, Nelsen, & Yust, 2016). While our project shares these goals, we expand the problem definition to include psychological barriers that can only be addressed through additional incentives.



A graphic summarizing the changes we plan on adding to increase the traffic between College Hill and the downtown communities

Through our research and discussions with stakeholders, we have developed a research question that encompasses many of the concerns iterated in past projects while allowing for a more comprehensive understanding of how to address the root causes of the problem. The final iteration of this research question is as follows: "How can we increase traffic between College Hill and the downtown communities by overcoming perceived barriers?"

Considering the research collected in the attempt to answer this research question, we have chosen to focus our attention specifically on the stairs and ways to overcome the perceived barriers. Our design seeks to revitalize the stair system between campus on College Hill and Third Street, incorporate the community through art, and involve stakeholders in the design process. The physical reach of this design extends through the existing three-branched pathway beginning at the Third Street entrance down the hill and ending at the College Hill egresses located near Simon Hall, South College, and Easton Hall. These paths were chosen based on complaints surrounding points of access (Student Survey, 2016) and poorly maintained existing infrastructure, particularly apparent at the closed path to Easton Hall.

The revitalization of the stairs encompasses a variety of technical changes, most prominently the addition of more stairs, intermittent ramps at pedestrian-friendly grade, the creation of 2 additional switchbacks, and the creation of virtually level patios at each switchback's landing. We also intend to construct stone walls for railing that serve as retaining walls and store our proposed lighting system. We recommend new landscaping to reduce erosion and maintenance on the Third Street slope. This vision of a safe and stable system of stairs provides a blank slate for the incorporation of art. These art features both encourage college-community collaboration and provide incentives for the variety of stakeholders. Further design details and drawings can be found in our Technical Analysis.

Through this design and the research process, we intend to address 5 project goals:

- To identify stakeholder positions and ways to leverage these into action
- Design a solution that emphasizes sustainability
- Design a solution that aligns with the goals of the community and of campus
- Overcome safety hazards; and
- Increase the appeal of using the stairs

These goals are guided by interviews with the community and seek to address commuting issues beyond the technical factors identified by previous projects.

The following analysis provides greater detail regarding process, results, and recommendations and is organized into 4 sections. The first section, Social Context, addresses problem definition through the framework of environmental, cultural, and psychological barriers to stair use. The second section, Policy Analysis, analyzes relevant policies behind the decision making process and analyzes the politics surrounding past stair projects and administrative inaction. In the third section, the Technical Analysis of the project is described in detail, addressing materials, construction, and geography in addition to providing visual details. The 4th and final section, Economic Analysis, addresses issues of funding, a qualitative cost-benefit analysis, and cost estimates.

SOCIAL CONTEXT

Introduction

Past projects have defined a problem based off a technical mindset, but with all the projects analysis there still has yet to be a final solution. We believe that the technical deterministic mindset will not provide the best solution for the stairs. Past projects have failed for reasons they could have avoided from the first outline of their project, by correctly identifying the problem. The stairs problem definition fits into the social contexts of the problem where we have found three factors that when grouped together define the overall stair problem that will increase traffic from College Hill to downtown Easton. These factors include an environmental factor, a cultural factor and a psychological factor. Besides the fact that various stakeholders identify the stairs as a problem there are other components that go into the research before any physical work can be done. Defining a problem correctly will fix the overall problem of a project, leaving less money and time wasted.

Environmental/Physical Factor

This factor is the one most people actively complain according to a student survey conducted in November 2016 sent out to the Lafayette College student body. The environmental sectors include the physical aspects that are decreasing traffic on the stairs due in part to a solution based off of physical change. Some safety aspects of the stairs include ice, leaves, poor lighting and the slope/topography of the stairs. Ice and leaves cause potential injuries and are safety hazards when combined with the steep slopes along the stairs. The stairs get little sun, which decreases melting time when ice forms. Due to ice forming on such a steep shady slope, the stairs are closed 30-90 days of winter (Oswald 2006). The lighting on the stairs does not meet the required 50-lux, which is the acceptable level according to the IESNA lighting handbook (Rea, 2000). Anything below 10 lux can cause perceptions of safety to decline rapidly. The poor lighting is due to overgrown trees from lack of maintenance and long distances between existing lampposts. Figure1. indicates lux readings throughout the stairs measured by Oswald's Independent Study data (2006). The student survey distributed in Fall 2016 shows weather and maintenance being the main issue when factoring in if they are willing to take the stairs or not:

"In the winter / when it rains I have great difficulty getting downtown. The costs of going downtown (mainly time) outweigh the benefits (stores). Instead of going to Gentlemen's for a haircut, I went to a place that wasn't as good on the hill because I didn't have much time" (Student Survey 2016).

Figure 2. Lighting readings on the stairs (Lux).

The slope and topography of the stairs are another concern the students voiced in the survey. The campus' elevation changes from a high point on campus of 360 feet at the rear of Skillman Library to a low point of 150 feet along the Bushkill Creek. There is an overall change in elevation of 210 feet across campus, from North to South (Lafayette College Master Plan). "Unfortunately the walk down the stairs are very grueling and difficult because of the angle the slopes are on, which range from 15-21% along the path" and half the students that took the survey wrote out comments about the exhausting upward climb, "walking up that hill is too much" (Student Survey 2016). Wilford-Hunt talked about how the high percentage slopes holds precedent when talking about a future solution, "So, certainly the topography is the big barrier. […] But when you are dealing with the hill it adds another challenge–and going down is easier than going up." Another safety issue in regards to the physical problem is that the current infrastructure lacks handrails on 60% of the descent, which is strictly against ADA safety requirements, "Handrails shall be at a consistent height above walking surfaces, stair nosings, and ramp surfaces" (ADA 2010). The stairs overall pose a safety risk of falling, especially when there is nothing to grab onto. There is also a lack of aesthetic appeal because there are weeds and overgrown branches that take away from the pleasure the people can take in walking up or down the stairs. Weeds such as poison ivy grow on the stairs and disrupt the path (Figure 2.).

Figure 2. Over grown poison ivy on the stairs.

There is a lot of cracking along the stairs and slopes that would need to be fixed for safety reasons in order to increase the traffic. Another safety issue that people have brought up is the lack of security in terms of line of sight, safety cameras and lighting at night. Walking alone at night up those stairs without a clear line of sight, caused by the overgrown tree branches and poor lighting, causes people not to use the stairs at night because they don't know what is around the corner. Dave Hopkins, Easton PA Director of Public Works, remarked when voicing his opinion about safety and the stairs. "Not being able to see that far in front of you causes a lack of incentive to walk up the stairs at night" (Hopkins 2016). This notion is important for the Lafayette Arts Campus because they hold movie showings past sunset and other talks and art shows at night. This is also important to the town of Easton because they want to increase the amount of business down the hill, including restaurants, which will have people walking at night to get home from dinner. The last technical problem that should be addressed in defining the problem is the lack of maintenance and the difficulty of getting supplies to the area to help out with the technical problems talked about above (weeds, cracks, overgrown branches etc.). This would have to be added into the budget and time schedule for Lafayette Plant Operations. A final note on problem definition defined by a technical fix is that Lafayette is one of hundreds of colleges that made a commitment to drastically reduce their energy consumption and become climate neutral and that includes any new projects, including the stairs. Any solution pertaining to the stairs will have to incorporate the increase in sustainable ratings around campus.

Cultural Factor

The next component of focus for the problem definition of the stair project centers on the culture of Easton, including the student body base on top of College Hill. This focus first hits upon the divide between the arts campus and the main campus at Lafayette College. The arts campus stresses sharing art pieces and movie screenings and gives the students a chance to form a

community around art. The integration between the two campuses does not happen because the culture at Lafayette dictates such a divide between the two campuses that the 'arts' in the liberal arts college is not being well represented to a crowd of students that do not major in arts. The benefit of Lafayette College is that it is a liberal arts campus with engineering and science based courses so the student body gets a diverse selection of classes. By increasing traffic across the stairs a broader education between the campuses can be reached. A Lafayette College student, Marissa Rossi, speaks about her personal experience:

"I am a biology major and I am involved in a lot around campus and I have meetings in Ramer History Hall and Oeschle, and though I don't take classes in history or psychology I am able to interact with the buildings and see what flyers are up and what is going on in their departments. Since none of my meetings or any activities I am involved in go on around the arts campus I have zero knowledge of what they are up to. There is such a divide and I wish that wasn't the case because I would love to be more involved with that brand new beautiful part of campus."

There is not only a divide between the arts campus and main campus, there is also a divide between the Lafayette community and the Easton community. Every year there is a community dinner hosted by POSP, a Pre-Orientation Service Program, through Lafayette College that honors a community member. Mayor Sal Panto Jr. annually attends and gives a speech to the 40 first year Lafayette students that participate. He always mentions to the students that this is their home for four years–that Lafayette is not it's own community, and that Easton is now your community too. He urges the Lafayette students to embrace Easton as their own. This is a problem that he feels is relevant to address to the student body base for the he feels a divide. With the future fix of the stairs an Easton resident states,

"Hopefully the fix works both ways: with students spending money in the city more often and residents of Easton attending more sporting events/open lectures/live arts performances." (Lehigh Valley Live).

Health is a subcategory in relation to the culture of a town and we want Easton to have a high health rate, as First Lady Michelle Obama pushes for better health across America. America is pushing for healthier lifestyle as obesity levels are still on the rise. Consequently, doctors and health policymakers are working on creating a country that will take the steps instead of riding an elevator or escalator. The steps may be a 'cardiovascular challenge', but doctors and health authorities are constantly encouraging people to do more active workouts to promote health, hopefully decreasing the obesity levels. Dr. Bryant from a New York Times article asserts that walking up stairs at a moderate intensity should burn 5 calories a minute for a 120-pound person, 7 for a 150-pound person, and 9 for a 180-pound person (Robins 2009). The fix of the stairs will increase traffic and by increasing traffic more people will burn calories and be healthier than if

they drove up the hill.

Easton's culture is centered around being a 'walkable' city. The existence of the Karl Stirner Arts Trail is just an extension of the broader vision of having Easton being a 'walkable' city. Dave Hopkins talked about Easton's plan for creating a "High Line" experience on the old train tracks crossing the Delaware River. The High Line is a 1.45-mile-long New York City linear park built in Manhattan on an elevated section of a disused New York Central Railroad spur called the West Side Line that incorporates artwork and landscaping to create a tourist attraction (Stern and Stern 2011). The idea of expanding spots to incorporate more landmarks only adds to the appeal that Easton brings forth for its residents and tourists. The city is not a high tech city like Singapore, it does not have a futuristic vibe and that means creating a stair way rather than a straightforward technical fix of an elevator or funicular. The Parks and Recreation department of Easton are working on a campaign to have more hills, increase access points surrounding the city and have more fitness activities (Baptiste and Kelly 2016).

Future aspects to consider that show that the stair project needs to be pushed farther into consideration is that the entire Lafayette communications division will go down there, including the back of the house operations unit for admissions, and the center for community engagement. This amounts to about 85 people going downtown that need to have easier travel interaction with the main campus. Another aspect of the culture of the city is that the Spot is to be converted into a college pub, which will increase traffic from main campus to arts campus for more social gain rather than academic, which will bring a different focused crowd to the Arts Campus more often (Wilford-Hunt, Personal Communication, 2016).

Psychological Factor

The final problem definition to consider is the psychological component that a lot of people neglect to integrate into the system of problem definition. The stairs are not in fashion at Lafayette College. At Indiana University it can take up to 30 minutes for a student to walk from class to class. The students do not have other options so that is set in their mind to just do it. At Arizona State University a lot of people ride their bike to class, that is their student's mindset. There are different perceptions of what it is like to travel around campus. At Lafayette College a sense of a 'small' college has turned into a very lazy campus when it comes to commute time, for many people do not like taking more than 10 minutes to travel anywhere, for that is the change time given by the college in between classes. This is the perception that the student body at Lafayette College has. The perception also includes that the stairs are not user friendly so just do not use them. One time going up and down them and people write them off. Livestrong hiking data suggests that for the average person the downhill time for the main path, being 1/7 mile, should take 4.28 minutes going up and 3.46 minutes going down. Oswald's Independent Study in 2006 suggested even faster times at 2:45 minutes to walk down and 3:30 minutes to walk up (Oswald 2006). From a student survey taken at Lafayette College out of 90 students, only 14 of those students correctly identified the correct times (Figure 3.)

How long do you think it takes to walk to get from the main campus to the arts campus?

#	Answer	%	Count
1	2-3 minutes	1.20%	1
2	4-5 minutes	15.66%	13
3	6-7 minutes	43.37%	36
4	8-9 minutes	15.66%	13
5	10+ minutes	24.10%	20
	Total	100%	83

Figure 3. Student Survey Data on their perception of time going up and down the stairs.

When Lafayette wants to get students to go to events, they market the event, they send emails and they outwardly encourage the students to attend. There has been no marketing of the stairs, only perceived hate from upperclassman being passed down from generation to generation over the years. The stairs need to be integrated into Lafayette the same way the stairs down to the

Kirby gym are. If people want to go to sporting events or work out they use those stairs, despite the climb being around the same distance as the stairs down to the Arts Campus. People use the gym every day, making it engrained in their minds that they have to use the stairs. From an early integration of the stairs from orientation to a continued integration through First Year Seminars, to having clubs use them, to the point of making people walk to their LANDIS community work by using them, people will be less afraid of them. The psychological barrier can be broken if it becomes just as much of the culture of Lafayette as the hate from the 152 years of rivalry against Lehigh.

Conclusion

Society has a tendency to move towards a technological fix. This is apparent in the interest in the elevator from many students and Easton community members. Engineering a physical solution is only one component of a fix. There needs to be more than the technological aspect, the cultural and psychological problem definitions also need to be taken into account. A lot of engineering projects fail because the team does not take the time to learn what the problem is and to create a fix that manages to address the root causes. Sometimes seeing a physical change makes people feel like they have fixed a problem because something new to the their line of sight has been developed. Looking at different problem definitions is key to a project that involves a copious amount of people because you are not just talking to one owner. In this problem definition we are not pleasing one sole owner, we have to please the masses. By knowing the environmental, cultural and psychological problems the political, technical and economic solutions will be able to settle on the best solution for the Lafayette Stairs.

Policy Analysis

In the process of analyzing the problem and developing a solution, we found it necessary to consider relevant policies and political contexts surrounding the problem of access between campus on College Hill and the downtown communities. The team considered three primary policies, Lafayette College's Master Plan, Easton's Comprehensive Plan, and the Karl Stirner Arts Trail Mission Statement as they not only provide guidelines for addressing projects like the Art Stairs but also highlight the goals and values of the involved communities. The politics of individual stakeholder positions were also considered through community mapping. The study of both policy and politics revealed that diverging perspectives have led to inactivity and projects that do not fully encompass the shared goals of community members, which provides further support for our proposed solution.

Lafayette College's Master Plan:

Any decision made on college property must agree with the goals and institutional strategies highlighted in Lafayette College's Master Plan. The plan, published in 2009 through the coordinated efforts of students, faculty, and administration, outlines a conceptual schedule for future construction based upon 4 guiding principles. These principles outline the college's desire to "strengthen the identity of the campus by reinforcing the portals and edges," "enhance college-community gateways," "enhanc[e] network[s] of pedestrian paths," and to "accommodate future new construction". The egress of the stairs at the intersection of Third Street and College Avenue is both a visual statement of the college's identity and a physical transition between the College Hill Campus, the Williams Arts Campus, and the Downtown community. The stairs are therefore essential to creating a unified identity between Lafayette academic departments and to strengthening the ties between the Easton community and the college. As an artery between the college and both I-78 and Route 22, the North Third Street entrance also serves as a greeting for tourists and College visitors. The third Master Plan principle stresses the importance of pedestrian paths, which must

This rendering from Lafayette College's Master Plan depicts plans to replace Pardee Drive with a pedestrian path. This project, along with several other pedestrian path renovations have since been completed.

include the stairs as they currently serve as the most direct pedestrian thruway between campuses. Considering the continued development of campus facilities downtown, the stairs must also be considered as a component of the fourth principle's discussion of accommodation for future construction. These four principles therefore not only directly impact decisions made about the stairs between campus and North Third Street, but also indicate that this project should be a priority in the college's construction agenda. (Lafayette College, 2009)

Reading beyond the guiding principles, the Master Plan highlights several other values and goals that impact aesthetic designs for stair renovation. These include promoting a "green and natural aesthetic landscape across campus", a factor largely neglected on the slope of College Hill that faces Third Street where brush, weeds, and poison ivy dominate the area. Our design incorporates measures to address this lack of aesthetic appeal while promoting a "natural" atmosphere lacking in other suggested designs. The Master Plan also stresses the need for downtown designs to be "aesthetically appropriate and compatible with adjacent buildings or street-scapes." We will closely adhere to this statement as our design involves preserving historic components of the stairs, integrating artistic elements similar to downtown sculptures, and remaining sensitive to surrounding historic architecture. (Lafayette College, 2009)

Easton's Comprehensive Plan:

The Comprehensive Plan, last published in 1997 and currently under revision, outlines community goals and values that should be considered in making alterations to a space that is not only visually prominent in the city but is also a part of pedestrian transit between city neighborhoods. The latter concern relates directly to the Comprehensive Plan's emphasis on transportation. The plan asserts that Easton will strive to "adapt and reuse critical sites at the seam of neighborhoods," "integrate Delaware and Lehigh Rivers, and Bushkill Creek with upland communities through a connected system of pedestrian, bike and open space networks," and to "manage parking and promote sustainable transportation" (Urban Matrix Architecture and Planning & Metropolitan Urban Design Workshop, 2016, p. 32). Our proposed solution supports these goals as it revitalizes existing infrastructure, improves pedestrian access, and features limited fossil fuel consumption.

KSAT Mission Statement:

A map of the Karl Stirner Arts Trail. The stair system begins at the point of intersection between the green and red paths indicated on the map.

While not directly essential in the development of a solution to physical access between communities, the Karl Stirner Arts Trail (KSAT) represents an integral influential force in our goals of increasing the appeal of using the stairs and of strengthening connections to the community. We therefore considered the mission statement for the KSAT as a guiding principle in our own designs. The mission statement's emphasis on reintroducing nature, "partnership with the diverse communities that vitalize Easton," and civic engagement are shared by the proposed Art Stairs. The KSAT's connection to the community, through its ties to the growing community of artists (E. Kerns, Personal Communication, November 1, 2016) as well as its ties to the college, through initial financial support and collaborative projects (D. McAteer, Personal Communication, November 2, 2016), make it an archetype for future town-gown relationships. The location of the stairs at the Third Street entrance to the KSAT, reinforce this ideological connection with a physical connection.

Political Context:

Given these three converging sets of goals and values along with the diverse communities they represent, we chose to consider the political contexts of the project through community mapping. Through interviews, surveys, and reviews of past statements, we have collected information about the various perspectives on the problem and proposed solutions in order to better understand how to develop a solution that addresses the needs of multiple stakeholders. While our process did not work to develop a physical representation of communities with participants, we ultimately used the idea of a map as a conceptual organization of varying perspectives based on geographical and political orientation. In this way, we were able to "give voice to […] participants, while also complicating simple notions of 'community'" (Parker, 2006). Understanding that there is divergence between goals of those in administrative positions, faculty positions on College Hill, faculty positions on the Arts Campus, the neighborhoods within Easton, and the student population is essential to promoting inclusivity and connection.

A visual representation of the stakeholders involved in this project. While helpful in understanding geographical relationships, this map is limited in its capacity to indicate diversity within these groups.

While this community mapping approach contrasts previous approaches to the problem, it does not solely account for reasons why past projects have failed to incite administrative action. As noted in our introduction, a diverse set of stakeholders has a vested interest in the problem. However, this salience has failed to instigate investigation until recent investment in the elevator project. Reasons for past inaction have been justified through concerns about technical and economic feasibility. Mary Wilford-Hunt, Director of Facilities Planning and Construction, discussed the physical complications of addressing the slope in our interview with her on October 14, 2016:

"It's challenging because it's a lot of work—a lot of steps. And it's also very difficult to get materials or equipment on that steep slope. So what would be minor repair in another case becomes a logistical challenge."

These physical challenges primarily translate into economic concerns. However, given that 9.5 million dollars are to be invested in an elevator project, it becomes clear that the hesitation surrounding stair reconstruction expands beyond monetary concerns. In an interview with Lehigh Valley Live, President of the college Allison Byerly remarks that the college sees the elevator "as

potentially […] very valuable, a signature aspect of the town that will set it apart" (Miller, 2016). This idea of a solution to the problem of access as an opportunity for the college to create a statement piece aligns with Lafayette College's Master Plan's principle of making the college "a memorable place" (Lafayette College, 2009, p. 5). However, the scale of investment in the solution over a less costly renovation of the stairs is at odds with Byerly's statement that they are attempting to "conserve the college's resources and devote more of them to supporting students" (Miller, 2016). Much of the controversy surrounding the discussion of an elevator stems from an understanding of opportunity cost. In an interview with The Lafayette, Easton Mayor Sal Panto indicates that he believes the project is a "waste of money" compared to other methods of addressing the commuting situation (Morse, 2016). This view of the 9.5 million dollar investment as limiting in its ability to provide diverse benefits has not been publicly acknowledged by the Lafayette administration.

It is also important to analyze reasons for investment in the elevator project at this moment in the college's history. Over the past several years, the college has invested over 20 million dollars towards developing the downtown William's Arts Campus (Merlin, 2016). However, no plans to address commuting issues were announced until August of 2016 (Byerly, 2016), after plans to move 85 administrators to the former Alpha Building were underway. Film and Media Studies Program Chair Andy Smith refers to this move as "a tipping point" in addressing the problem and notes his uncertainty over whether or not the connection to the arts campus would have been transformed into action without it (Personal Communication, October 24, 2016). Art Department Professor Ed Kerns discusses his thoughts on the motivations behind pursuing this particular project over other less expensive ideas:

> "I think they're going for the ideas that best suit persons on the board who might donate money to it. That's always the case. I mean if I asked for money for more paint and they developed a need for someone to give us more computers, we'll get more computers […] because that's where the money is." (Personal Communication, November 1, 2016)

While the college's spending on the arts campus reflects its investment in the arts (A. Smith, Personal Communication, October 24, 2016), Professor Kerns' commentary reflects the prioritization of technological investment. His statement also reflects Maurrasse's assertion that "[collegiate] institutions also are becoming increasingly corporate in nature" (2001, p. 11). Understanding the economic motivations and opportunities is essential for understanding the history of the project as well as for developing paths forward.

An understanding of how the problem is defined by various stakeholders is also essential to understanding desired outcomes and reasons for past inactivity. One of the major points of controversy that emerged from our discussions was the lack of ADA compliance in commuting

options between downtown and College Hill. The stairs as they exist do not meet compliance standards which require ramps sloping no more than 1:12 (Guldman) and continuous handrails on both sides of the path (United States Access Board). In the 2014 Engineering Studies Capstone project, an interview with Mary Wilford-Hunt indicated that a campus wide ADA evaluation was being conducted. The evaluation is now at its final stages of revision and is being used to "systematically address projects" (Personal Communication, October 14, 2016). She asserts that she and the rest of Facilities Planning and Construction "are always looking for opportunities when we are doing more work […] [to] effectively address ADA issues (M. Wilford-Hunt, Personal Communication, October 14, 2016). While no specific mention of making the stairs ADA compliant was made, these statements do indicate a broader trend in Lafayette College's construction. Asking City Planner Dave Hopkins about whether he thought ADA compliance was a priority in the solution to this issue indicated a different viewpoint. When asked how he would rate the importance of ADA compliance in the stair solution on a scale from 1 to 5 with 1 being very unimportant and 5 being top priority, he indicated that compliance was "just impossible" and rated its priority a 1 (Personal Communication, October 26, 2016). Art professor Nestor Gil asserts that the issue of access for those with disabilities is of "dire importance" (Personal Communication, November 7, 2016). However, he does not see this particular portion of the problem as a key component for the stair design noting that "the questions about how the stairs could be made to accommodate seems to me like a question that's built to sort of throw the stairs under" (N. Gil, Personal Communication, November 7, 2016). The consideration of ADA compliance as part of the problem presents significant changes to addressing the issue and can therefore be understood as an obstacle in past discussions. However, given that other provisions, such as the LCAT shuttle and Public Safety, are available for people with disabilities, we do not consider this to be a constraint in our solution. Furthermore, while the elevator does bypass the most difficult portion of the slope, many of the paths on College Hill still remain inaccessible to wheel chairs due to slope and terrain.

After receiving feedback on problem definition, we investigated what stakeholders would like to see in a solution. A variety of recommendations were given, including Mary Wilford-Hunt's suggestion of a shuttle incentive program (Personal Communication, October 24, 2016) and Ed Kern's proposition of a restaurant on the stairs (Personal Communication, November 1, 2016). However, most suggestions revolved around previously considered solutions such as Jim Toia's recommendation of better lighting and consistent stair height (Personal Communication, October 24, 2016), Dave Hopkin's suggestions to lessen slopes, address railing issues, and make it a maintenance priority, and Nestor Gil's suggestion of placing park benches at each landing. Both Ed Kerns and Dave Hopkins expressed their desire to see better lines of sight through improved landscaping. The idea of providing incentives along the commute through art installations has the

potential to entice College Hill residents to visit the downtown community. If the commute were to be a destination in itself—"a place to be" in the words of Nestor Gil, then the other downtown destinations may be made more appealing. Eliminating barriers between Lafayette College students and the downtown community will facilitate pedestrian traffic and investment in local businesses. In order to raise support and develop ownership of this issue, we believe that it is necessary to document and consider all of these inputs in design.

Perhaps the most neglected consideration in past and current projects is the understanding of who the client is. As noted in the Social Context section, the issue of town-gown relationships is widely recognized in discussions of physical links between Easton and Lafayette College. However, the proposed elevator design fails to consider how to make the commute more appealing to communities beyond the students. Historically, colleges and universities have succumbed to this campus-centric model in which the focus is placed on "increasing student access to community resources" (Bruning, McGrew, & Cooper, 2006, p. 126). Mayor Sal Panto describes one of his concerns regarding the elevator solution in his statement that "looking at where it comes out on the campus, I don't see neighbors using it" (Morse, 2016). The elevator is planned to connect the area behind South College to Bushkill Drive, providing a singular entrance to the campus versus the three-point entrance provided by the proposed stair system at Easton Hall, South College, and Simon Hall. Furthermore, Nestor Gil expresses his personal belief that the student space surrounding the dormitories should be left to the students, leading him to prefer the Simon Hall entrance to the stairs (Personal Communication, November 7, 2016). With these comments in mind, solutions that are grounded in a Lafayette-biased problem definition must be considered critically.

Through this analysis of the problem's evolution and growing presence throughout the college's and City's growing relationship, it is clear that the proposed Art Stairs coincide with the goals of both the Lafayette and Easton communities by addressing safety concerns and increasing the appeal of using the stairs through art. Even more important to this solution is the continued involvement of stakeholders in order to increase a sense of "personal investment," which is recognized as "an important contributor to a person's […] sense of community" (McMillan & Chavis, 1986, p. 10,). If moved into the administrative agenda, this project will require coordination with local artists, networking with downtown bookstores and libraries, and additional trans-neighborhood interactions that will strengthen both physical and symbolic connections between communities.

TECHNICAL ANALYSIS

Introduction

A massive part of overcoming the perceived social, cultural, and environmental barriers that hinder the use of the pathway up college hill is to physically remodel and aesthetically revitalize the stairs themselves. In taking an approach to make the stairs safer, easier to climb, and providing an incentive for both communities to do so, we hope that we will be able to increase traffic and regular use of the new environment we propose.

Figure 1: Regular cracking in steps and pathway

One of the primary difficulties in engaging the community with the stairs is the poor state that they are currently in, and how many people find them relatively difficult to climb (See Social Context). The stairs are not level, the walk is steep, and is generally strenuous for many who use them regularly (Student Survey 2016). Many of the inclines on the path are steep, broken, and in general, poorly maintained (See Figures 1, 7). The proposed technical solution is to completely repave the pathway with a more manageable material and with a less severe incline, in addition to adding stairs so that the ramps aren't so long and exhausting. With the pathway redone, both pedestrians and maintenance staff will be able to appropriately, and regularly, travel on and make use of this space when they need to. Furthermore, the current railings don't provide a sense of safety at all, so these would likewise be redesigned for a more comforting and less physically demanding appeal.

The current lighting situation is not nearly enough to keep the pathway appropriately lit at night, which has created a concern that traveling on the stairs "is unsafe at certain points" during off-peak hours (Student Survey 2016). Therefore, installing new lighting fixtures may also be part of the solution to this issue.

However, the appeal of using the stairs is what will hopefully draw more people to use it than it does now. The implementation of patio areas to relax at, artistic features to both observe and interact with, and the creation a more visually appealing landscape around the stairs will hopefully be the final adjustment that will provide an incentive for its overall use. These stairs

have been a historical part of the College Hill environment, so redesigning them to be more durable, sustainable, and appealing will hopefully enable them to continue to be a significant part of both Lafayette College and the Easton community.

In addition to making them generally safer, an incentive to use the stairs is what will hopefully draw more people to use it than the current design currently does. The implementation of patio areas to relax at, artistic features to both observe and interact with, and the creation a more visually appealing landscape around the stairs will hopefully be the final adjustment that will provide an incentive for its overall use (See Figure 2). These stairs have been a historical part of the College Hill environment, so redesigning them to be more durable, sustainable, and appealing will hopefully enable them to continue to be a significant part of both Lafayette College and the Easton community.

Figure 2: AutoCAD Drawing of new stair design, including the existing outline of stairs (See Figures 3, 10, 11, 12 for details on specific features).

Past Projects and Research

Past projects that have investigated ways to redesign the stairs have attempted to address the issue of the underutilization of the pathway in the past, but so far, there has been almost no progress made. Recent capstones have looked at improving the grading of the pathway of the entire hill and adding extra stairs in new areas, but have only made technical recommendations, and have not looked at how to realistically enable pedestrians to view the stairs as safe and desirable to travel on (Nelson, Gross, Simmons & Bisignano, 2013; Chiles, de Lucio & Lomanto, 2014). The arts campus at Lafayette College sits right at the bottom of the stairs, and the undesirable qualities the stairs have made it a barrier between the upper campus and the arts campus, as well as the Easton community as a whole. The art community in Easton has begun to thrive the past several years, and creating this kind of incentive in addition to physically redesigning the stairs may be the necessary approach to succeed where past projects have not. There has also been a lot of focus on ADA accessibility for the stairs, which after interviewing several stakeholders and community members such as Dave Hopkins, Nestor Gil, and Jim Toia, we have determined not to be of utmost priority in our proposal. Not only is it somewhat unfeasible to try to implement due to policy and physical practicality, but there are already other options set in place to address ADA compliance, such as the existing LCAT system, Lafayette College Public Safety, as well as the proposed elevator project the college has been working on. There is further research that needs to be done in order to establish the best overall solution, which we may address later on in our project. However, this has not been a priority as we've developed our design concepts, especially considering the options the college has and plans to have available. One of the main research concerns we have is topographical information, of which we have not been able to obtain to any useful extent due to inaccuracy and outdated data, as well as how to even properly carry out construction accessibility of this scale on the hill. Reconstruction is something we must look into with regards to carrying out this project, as the stairs are heavily restricted by dorms at the top of the hill, College Avenue at the bottom (one of the busiest roads in the area), as well as the current landscape and current state of erosion. We want to preserve and facilitate the life around the hill, not interfere with it. Even if none of our proposed plans are feasible in the near future, the direction we are going in and the focal points of addressing this problem we believe are crucial factors that are huge improvements over the research that has been done already.

The arts campus at Lafayette College sits right at the bottom of the stairs, and the undesirable qualities the stairs have made it a barrier between the upper campus and the arts campus, as well as the Easton community as a whole. The art community in Easton has begun to thrive the past several years, and creating this kind of incentive in addition to physically redesigning the stairs may be the necessary approach to succeed where past projects have not. There would very likely be many community members beyond Lafayette students and faculty that would be very enthusiastic about sharing and incorporating their work into a revitalized staircase (Nestor Gil Interview, 2016).

There has also been a lot of consideration of ADA accessibility for the stairs, which after interviewing several stakeholders and community members such as Dave Hopkins, Nestor Gil, and Jim Toia, we have determined not to be of utmost priority in our proposal. Not only is it somewhat unfeasible to try to implement due to policy and physical practicality, but there are already other options set in place to address ADA compliance, such as the existing LCAT system, Lafayette College Public Safety, as well as the proposed elevator project the college has been working on.

Construction feasibility is something we must look into with regards to carrying out this project, as the stairs are heavily restricted by dorms at the top of the hill, College Avenue at the bottom (one of the busiest roads in the area), as well as the current landscape and current state of erosion. We want to preserve and facilitate the life around the hill, not interfere with it. Even if none of our proposed plans are feasible in the near future, we believe that the focus on community involvement as a solution to this problem is a huge improvement over the research that has been done already.

Grading and Paving

The current state of the stairs is deplorable. There are cracks in the pavement, stones and the railings mounted on them are falling apart, and the pathway has become an eyesore, not to mention the physical soreness that comes from having to tread the steep ramps (See Figures 1, 7). As soon as you round a bend coming up the pathway, there is yet another steep incline to attempt, and after that, another. Our vision for the stairs proposes a milder system of slopes and stairs through the addition of several switchbacks and more sets of stairs (See Figures 2, 3). We will add one switchback on the path up to Easton Hall and one immediately after the Third Street entrance. We also propose 26 additional sets of stairs. Each new set of stairs ranges from 6-8 steps, a relatively small amount compared to current sets which range from 7-15 steps per set. Each step would be 7 inches high and 12 inches wide, providing consistency and therefore additional safety to the new system. We have considered the benefits and drawbacks of adding these stairs and have found that the safety added by the lessening of steep slopes from the current 15-21% to a consistent 8.3% ultimately outweighs the psychological costs that adding stairs may have. Having the pathway broken up between stairs and ramps would likely seem less exhausting than the current effect the long ramps have on its users. Although this ramp grade is under ADA compliance, we do not intend to make the overall system ADA compliant due to the severity of the slope and constraint with regards to space and construction.

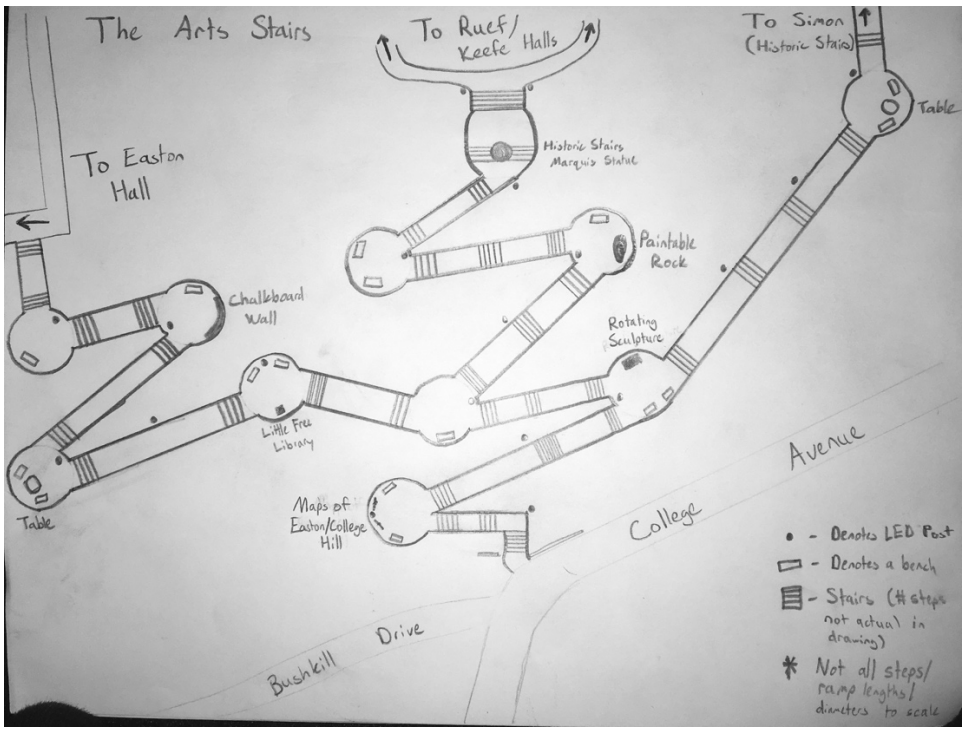


Figure 3: Preliminary Feature Placement Drawing

At each landing, we wish to expand into patio areas, both for people to stop and rest if they need it, but also to include features that may actually coerce pedestrian traffic to stop for a minute and enjoy the area (See Figures 2, 10, 11). One of the main safety concerns that the existing stairs manifest every year is the accumulation of water on the pathway. Poor drainage and direction for water flow cause the surface to be slippery, dangerous, and otherwise unusable, especially during the winter season where water creates cracks in the pavement, causing the pathway to continuously break apart. With consideration of using patios, appropriate drainage must be taken into account. In additional to grading each patio at 2%, we have looked into potential paving materials that allow for adequate water flow to minimize accumulation of puddles, ice, and snow, while making the space easier to maintain. Additionally, a material that can avoid wear and tear such as cracking from ice and general use would be optimal, to avoid unnecessary and painstaking maintenance.

Figure 4: Turfstone, to be used for patios.

One such paving material we have selected is the use of Permeable Interlocking Concrete Pavers (PICPs). Once placed, the shape of these easily installed bricks allow for plenty of space through which water may flow, and can be individually replaced should a specific block become cracked or worn down (Dietz 2011). With that being said, this material generally does not need to be maintained that often, so the need to replace certain bricks is far less common than if we were to use concrete, brick, or many other generic pavers. Turfstone® is a particular PICP of interest due to the ability to have grass (or whatever the college may desire) planted in the holes it creates, not only allowing for water flow but creating a green aesthetic while also providing a stable recreational space. This material used at a patio could make the area safe, relatively easy to maintain, as well as give a fresh and inviting air to these relaxing spaces.

Figure 5: Flexi-Pave, to be used for ramps.

For the pathways themselves, KBI Flexi®-Pave is an alluring alternative, do to how it is likewise conducive to allowing water to pass through into the earth, as well as the fact that it is made almost completely of recycled tires (Figure 5). In the Bronx Watershed Initiative Project, the state of New York likewise looked into Flexi-Pave and PICPs as options for a porous alternative to impervious pathway materials (New York State Office of the Attorney General, 2008). It is flexible, which means cracking is a non-issue and in the rare case of replacement, relatively easy to maintain. Thousands of gallons of water can easily pass through it, so water runoff and buildup is hardly an issue with this material in the first place. It can come in many colors, whatever may be most desired by the community, so it doesn't have to be a flat black tire-esque walkway.

The appeal to both of these potential pavers is their sustainable natures, both in aesthetic appearance and interaction with the physical environment of the hill. They both could be more costly than simply pouring concrete or asphalt may be, but they provide benefits that could prove more economically and practically efficient throughout their lifetimes. These materials are not as traditional as some of the other paving options that may be available, but they are the pavers we deemed most in tune with our goals for this project.

In conjunction of remodeling the pathways, the corresponding railings must also be re-imagined. We currently have metal railings which are falling apart, so they may need to simply be updated with newer ones, but we are also considering thick stone retaining walls to go along with the new aesthetic (Compare Figure 6 to Figure 7). Not only would it look nicer and feel safer than flimsy railings, but it may also allow for installation of lower LED lights to illuminate the pathway itself. In addition to this, retaining walls are great components for erosion control, which is something we already need to keep in mind when grading the pathway again.

Figure 6: Durable retaining walls can be added for improved aesthetic and overall integrity of hill and pathway.

Figure 7: Current State of Railing

Lighting

Figure 8: Example of Traditional Style Lamppost

The light fixtures that exist now do not provide adequate luminosity for the entire area they must cover, so installing more luminant LED lampposts at each landing, in conjunction with additional pathway lights (See Figures 8, 9), may provide more than enough lighting to clearly see the path and in turn avoid any safety hazards that may manifest in the future. Lighting on college campuses, especially at night, is a crucial part of pathway design to ensure that people who are walking are able to identify and avoid hazards appropriately (Holst 2013). Adding new lampposts and installing pathway LEDs is the best way of providing the adequate lighting on the hill, and subsequently reassuring pedestrian safety, which has been lackluster throughout the past several years.

We wish to go in the direction of LED lighting due to a cheaper maintenance cost, a longer lifespan than the bulbs currently in use, and the overall better luminosity in the area, which may even mean fewer fixtures required. LED lamps can have a lifespan of around 50,000 hours or 10 years of use, which can be compared to the normal ballast lighting lifespan of almost 5 times less than that. This difference alone will account for a significantly lower maintenance cost when switching the stair lampposts to LED technology (Holst 2013). Brighter lamps would mean fewer fixtures necessary on the hill, but there must be a balance to be made so as not to be too overwhelmingly bright for people traveling up the stairs. To maintain consistency with the existing aesthetic of lampposts on campus, the posts that should be considered most are LED lamps in the traditional style (See Figure 8). Installation would likely be expensive, but the long-term cost benefits would likely far outweigh the initial cost. We want to make the stairs sustainable, so we have discussed integration with solar panels up on campus, but it is unclear how feasible that concept is at this time.

Figure 9: Potential style of walkway lights (Specific Lighting Fixtures still undecided, depends on school's plan which makes a definitive fixture difficult to determine at this point, may look into school specs over break)

For potential lamppost options, the Final Report prepared in support of the DOE Solid-State Lighting Technology Demonstration GATEWAY Program analyzes several optimal LED lighting options for pedestrian pathways (Pacific Northwest National Laboratory, 2013). This is likely a resource the school can use in conjunction with Lafayette's energy policies in order to make our decision on particular fixtures. Each post could have a price range of a couple hundred to a couple thousand dollars, depending on options to make the posts solar powered, how tall they need to be, how luminous they are, and generally any kind of aesthetic or functional advantages each option holds. Installation would likely be expensive, but the long-term cost benefits would likely far outweigh the initial cost. With minimal maintenance throughout the lifetime of these fixtures, purchasing and installing the lights would be the primary cost the school would need to consider. The final choice in exactly which fixture is the best is ultimately up to the school's discretion.

We want to make the stairs sustainable, so we have discussed integration with solar panels up on campus, but it is unclear how feasible that concept is at this time. Some lamppost options even come with integrated solar systems, so the necessity for a completely new grid may not even be necessary if this is the route the school wants to take. Solar access for these lamps would, however, require better access to the sky from the hill, meaning tree branches would likely need to be trimmed. Since our solution should not interfere with the natural environment, this may not be a choice that is viable, but it is worth considering.

There are many cost-effective options for how the school may go about relighting the arts stairs with sustainable and reliable LED technology, so this is one part of our overall stair design worth considering for the long term.

Artistic Components

Considering how these stairs are used quite frequently by students and faculty of the arts campus, as well as many other Easton community members, an artistic and community-centric component is crucial to incorporate into the stairs. At each patio, we wish to add benches to promote the patios as areas for rest and relaxation, but we want to provide something for people to do at each landing (See Figures 2, 10, 11).

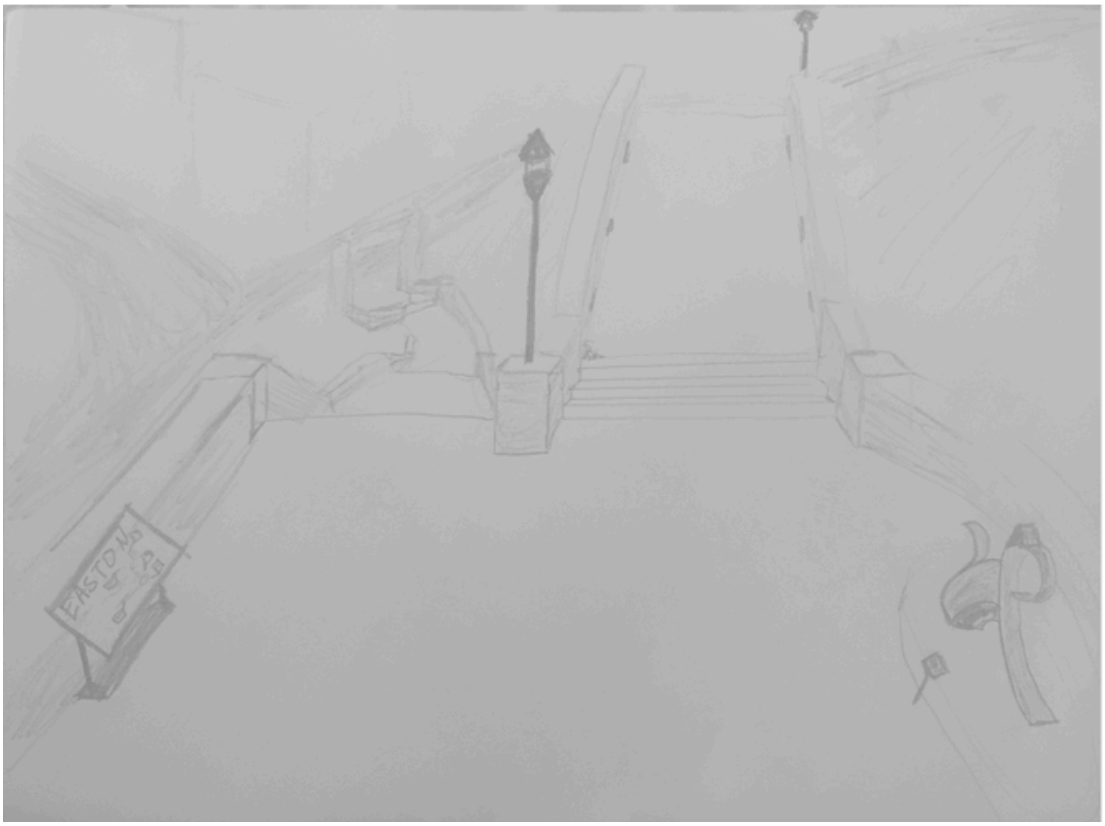


Figure 10: Ruef/Easton Stairs first landing, preliminary design. First landing Potential (Easton Map on Left, Weekly sculpture on the pedestal to right).

At the first landing where the pathway splits into the Ruef and Simon pathways, a feature we would like to include would be a spot to display a new sculpture every week/month/other interval, with a sign describing the sculpture and a short biography of the artist, member of the Easton community or Lafayette College member (See Figures 2, 10). We wish to invite Lafayette community members and local artists to offer their talents to display to foot traffic, and a free-standing sculpture on display would serve as much more aesthetically pleasing than a rock face and unkempt hill would. In addition, a map of the local area would be a convenient addition, highlighting places on campus and in the center of town, to make community members more

aware of the amazing space they have around them, and hopefully encourage them to travel farther than just to and from classes. (Figure 2 Represents most up-to-date placement of maps and other features).

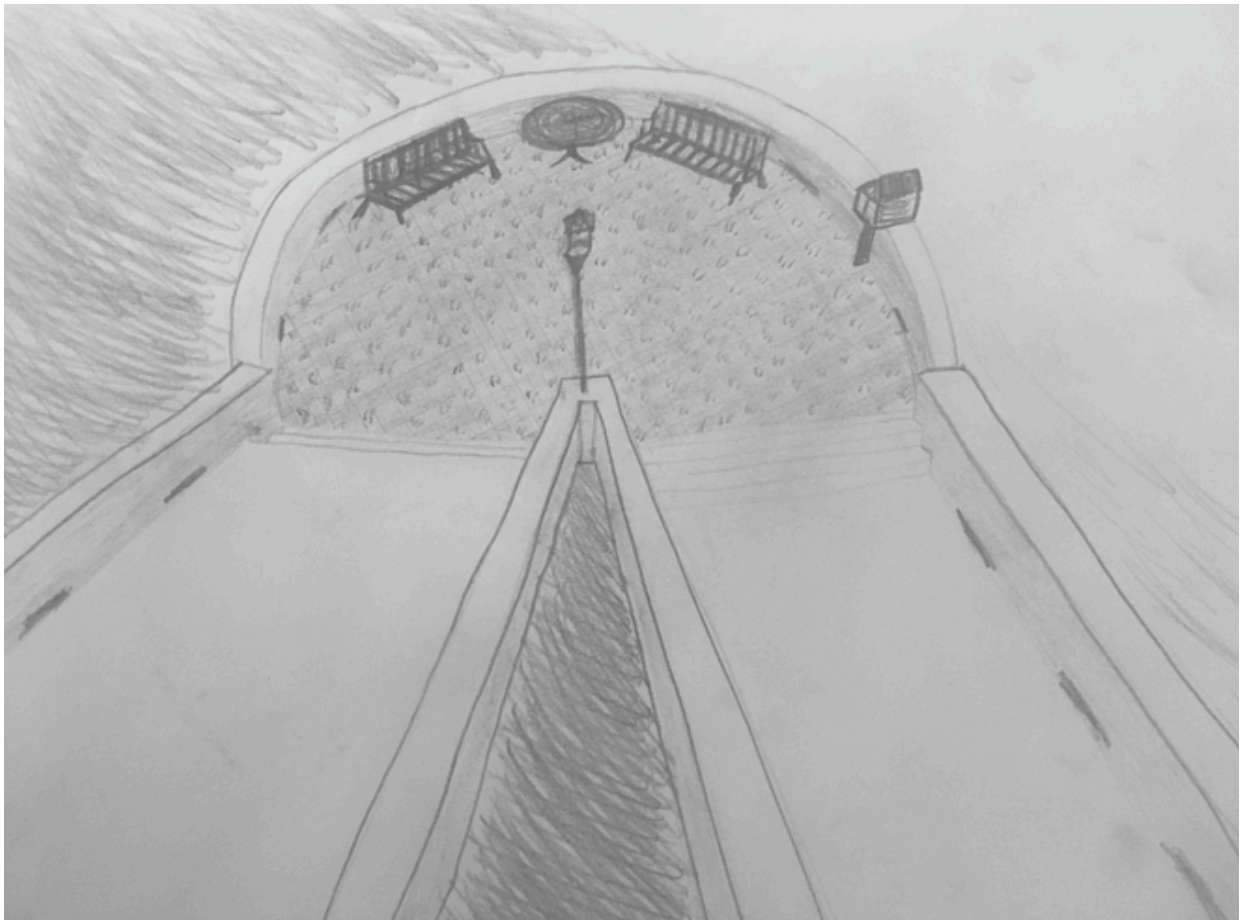
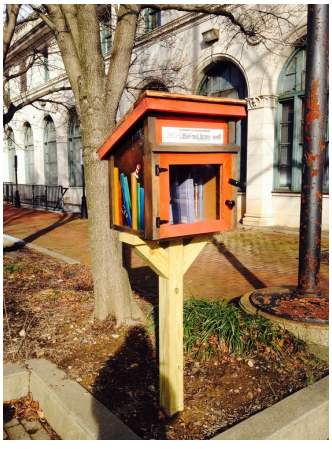


Figure 11: Generic patio area. Turfstone floor, benches, table, and Little Free Library Stop pictured.

Many schools have a rock or object that gets painted over daily, so putting a rock or something of the likes could be an interesting art component for students to regularly participate in, which is one idea which would be really exciting to have at our school as well (See Figure 13). Another landing could have a Little Free Library stop (Such as in Figures 11, 12), which is an outdoor waterproof bookshelf where someone may freely take out a book and read it as they rest, or alternatively leave a book of their own for somebody else to enjoy. Easton already has several Little Free Libraries implemented, so this could be one



simple way of utilizing the city's efforts to better connect the community. Chalkboards, mosaic stairs, or designs on the walkway itself are other artistic features proposed to make the stairs more engaging as well.

Figure 12: Little Free Library bookshelf.

Figure 13: A large rock could sit on the hill for students to cover with paint, interact with, and show school spirit.

Landscaping

The hill is a shady and wet area, and with erosion becoming a concern for us, we wish to landscape the area with local plants that are both visually pleasing to look at, but also very durable so that the hill may maintain its current physical state. The environment and the pathway could work hand-in-hand to maintain the integrity of the hill itself. Wild Geraniums (Figure 14) and Jacob’s Ladder are two such plants that are low maintenance and could be very useful in this

matter. The Pennsylvania Bureau of Forestry also has plentiful resources in maintaining erosion. In their Planting and Seeding Guidelines report they recommend other mixes of seeds to sustain erosion control through wet and dry seasons, one particular mix of plants including deertongue, autumn bentgrass, and partridge pea (DCNR 2016). In addition to the benefits of erosion control, these plants are low-lying and won't block the line of sight from the pathway, so they will promote general safety as well as aesthetic on the hill. There are many options the school could choose to plant depending on cost, but these low-lying shrubs are the best recommendations we have at this time.

Figure 14: Wild Geraniums are durable, low height plants that could be great for hill landscaping.

Maintenance

We want the stairs to be easily maintained, and we hope that with repaving, the path itself will require minimal attention. The stairs have been subject to corrosion due to the use of salt to eliminate ice, but with new pavers, we hope to keep corrosion or any other form of breakage and wear and tear at a minimum. With LED lighting, we hope to require fewer visitations and repairs on the electrical grid running down the hill. With landscaping and potential grass around the patio areas, we hope that simply cutting the grass or trimming the plants will be more than enough to keep it looking in an attractive state. We want the stairs to be easy and sustainable in the long run, and the less attention they need, the better.

Conclusion

Especially in consideration of the school's' proposal to expand, greater traffic is imminent, and we wish to bring that traffic both up and down the hill. We want to provide a reason for people to be there and enjoy the stairs, not simply use them, but to interact with them. We want to provide a lasting space that will bring community members together in as many ways as possible and to revitalize the image and use of the stairs. The stairs coming up from 3rd street need to be safer for pedestrians, but also must be more interesting if we actually want it to be a regularly traveled pathway. Making the pathway significantly less steep, easily maintainable, and better lit are ways

the stairs can be made into a safer, more durable piece of infrastructure. Additionally, we believe that the integration of the patios and corresponding features are a great way to both technically and artistically generate an area to involve the entire Easton community and break down the barriers the hill has created. Overall, we believe that our design is one of the best directions to follow in achieving that goal.

ECONOMIC ANALYSIS

Introduction:

While many think of economic analysis as a simple cost-benefit comparison, there is much more involved, especially when the costs and benefits of a project are more abstract. The Art Stairs, for example, have very little in the way of tangible monetary benefits, necessitating a discussion on the project's economic context. For the Art Stairs, the project's economic context is defined by the relationships between the various stakeholders as well as their goals. The two main communities involved in our proposal are the City of Easton and Lafayette College, both of which would benefit from the revitalization of the Third Street stairs. The city would benefit from increased revenue, as more students would be willing to make the journey into Downtown Easton to visit local businesses. Lafayette would benefit economically through the school's planned expansion. Lafayette is currently planning to increase the size of the student body by expanding further into College Hill (Tatu, 2016). Easton citizens have initially been resistant, but we believe that the improved connections between Easton and Lafayette will allow the school to expand its campus further into Downtown Easton, if they can continue to prove their economic value to the city. A revitalized connection, in the form of the Art Stairs, between Downtown Easton and College Hill could also prove to be an attraction for both the school and the city. People visiting the Art Stairs would generate revenue for the city and a connection that is seen as a point of pride rather than an obstacle for travel would certainly help to increase student interest in Lafayette. The potential for both the City of Easton and Lafayette College to significantly increase their revenue creates a situation where improvements will almost certainly be made. The difficult decision now is determining what improvements to make.

While not the only part of economic analysis, cost considerations are still extremely important to a proposal's economic viability. In order to determine the economic feasibility of our proposal, the team made a variety of community contacts and gathered a wide range of resources from previous projects that had similar goals. We also thought that it would be beneficial to compare the cost of our proposal to current and future alternatives, namely the Lafayette College Area Transportation Shuttles, know colloquially as the LCAT shuttles, and the Skyway Elevator proposal. It was difficult to determine precise costs for the three projects as we could not receive estimates from contractors and the school was unable to disclose certain information. However, through extensive research the team was able to determine ranges of prices based on material and service cost estimations. In addition to the costs of the projects, the team determined that an essential factor in the analysis would be funding. Without adequate sources of funding it would be impossible for the team to realize the goal of a more connected Easton. It was decided by the team that the best way to fund the proposal would be through a combination of fund raising efforts, state grants and increased revenue through the school's expansion. The team determined that with a relatively reasonable price tag, as well as adequate sources for funding, our proposal could be a viable solution to one of the schools most persistent problems.

Alternative Projects:

In order to fully assess the feasibility of our proposal, it is necessary to include analysis of alternative solutions. Without other options to compare and contrast to our project it becomes very difficult to understand the relative costs and benefits. The two main alternatives to the Art Stairs are the Skyway Elevator and the LCAT shuttle. While the Skyway elevator has not been approved yet, it has certainly gained enough traction to warrant discussion. The project includes the construction of a glass elevator, an observation deck and a 100-foot walkway. The elevator is expected to be able to hold up to 25 people and will likely be open to the public. With this proposal, the current stairs will remain unchanged as an alternative to the elevator, but will likely remain in their current state of disrepair as their usage declines. The current alternative to the 3rd street stairs, the LCAT shuttles, is a system of shuttles that ferries students between various locations around campus and the greater Easton area. The shuttles are run through the Palmeri Group who have a contract with Lafayette. They facilitate travel to locations that are outside of walking distance as well as make travel easier to isolated parts of campus, notably the arts campus. According to our survey, however, usage of the LCAT system is extremely low as only 1 of 86 respondents reported that the LCAT system is their primary method of commuting between College Hill and Downtown Easton (Student Survey, 2016). The team believes that the art stairs would be a far more viable solution than either of these projects, but in order to confirm this we must analyze the economic components of all three solutions.

The costs of the LCAT shuttle system are difficult to ascertain, as we were unable to obtain the contract between the Palmeri Group and Lafayette College. However, knowing that the shuttles are contracted out does help with estimating the costs of the service. This means that there is no initial cost, maintenance fees or gas expenses but simply one flat fee each year. Because of this, the team decided the best way to estimate this would be on a per student basis. We could not find much information about shuttle bus expenses but we were able to find out extensive information about annual school bus expenses per student. While it is likely that a school bus makes more trips per

year, it is also likely more efficient per student as it can take far more students per trip. According to the National Center for Education Statistics it costs approximately $692 per year to bus one student to and from school every day (“National Statistics”, 2011). We used this number to estimate a range for the yearly cost of the Palmeri contract. To get the low-end estimate we multiplied the yearly cost per student by the percentage of the student body that named the shuttle as their main form of transport. This ended up being just below $20,000 per year. For the high-end estimate we multiplied the yearly cost by the entire student population and found it to be around $925,000 per year. This is obviously a very wide range but without more information it is difficult to be more precise. The team however, determined that it was likely in the higher end of our range, as the Palmeri shuttles almost certainly carry fewer students per mile and lose efficiency due to the smaller scale of its operation. Overall, the team decided that while some aspects of the LCAT system are necessary due to ADA compliance issues, it is extremely inefficient. Unless more students begin to take the LCAT shuttles, the system will need to be adjusted.

The costs of the second alternative, the Skyway Elevator, were slightly easier to estimate due to information directly from the school. According to The Morning Call, Lafayette’s vice president for finance and administration, Roger Demareski, estimated the initial cost of the project to be $9.5 million (Miller, 2016). This does not, however, factor in the maintenance or electrical costs. After averaging several sources estimates for these costs, we determined that the project could cost anywhere between $500,000 and $12 million over the course of the elevators 25 year lifetime (Miller, 2013). Using annual worth analysis with an interest rate of 5%, the team determined that the total annual cost for the elevator would be between $575,000 and $1,200,000. This is far from an ideal price for a project that has few advantages when compared to the current system. Even the

Mayor of Easton, Sal Panto Jr., considered the project to be unnecessary in his recent interview with the Lafayette Student Newspaper:

This summer there was also the announcement of the elevator.

"Yes. Waste of money."

Really?

"[…]You have to put an elevator in, now you have a reason to have an elevator, rather than having just an elevator, which to me does not make use of the $9 million. Put $10 million in or whatever it is to build another dormitory which would still do the exact same thing. I also liked the idea of bringing back the trolley going up the hill.

Because the elevator, looking at where it comes out on the campus, I don't see neighbors using it. If it becomes just one big elevator, we can make it a tourist attraction, going up there and having a great view of the city and get some nice photos. But, I think there are other ways of doing it."

You said it's a waste of money, but it's not Easton paying that money. It's mostly Lafayette and the state?

"It's mostly Lafayette and the state."

So that's why you would be okay with it being built?

"Exactly. It's not my money, but if I were on the board of trustees, I would be looking at a way to maximize that elevator. If they really want to do something for the neighborhood, the elevator has to get somewhere closer to Cattell Street, and it's not going to get there." (Morse, 2016)

As can be seen in the interview, the only reason that the Mayor Panto Jr. supports the project is because it benefits the citizens of Easton at no cost to the city. He argues that there are better alternatives to the Skyway Elevator due to its enormous price tag. While the Skyway Elevator is an interesting and fun idea, it does little to improve campus life. This coupled with its extremely high prices make it a far less optimal alternative to the art stairs.

Stairs Economic Analysis:

While the cost of the Art Stairs proposal is as difficult to assess as the alternatives, the team determined that the range of estimates fell within acceptable parameters. The Art Stairs are projected to have relatively high up front costs but extremely low maintenance and upkeep costs. The biggest difficulties in determining the cost of the proposal are deciding what fixtures to include as well as determining the markups due to the difficult terrain. The first costs the team aimed to determine were those associated with the paving

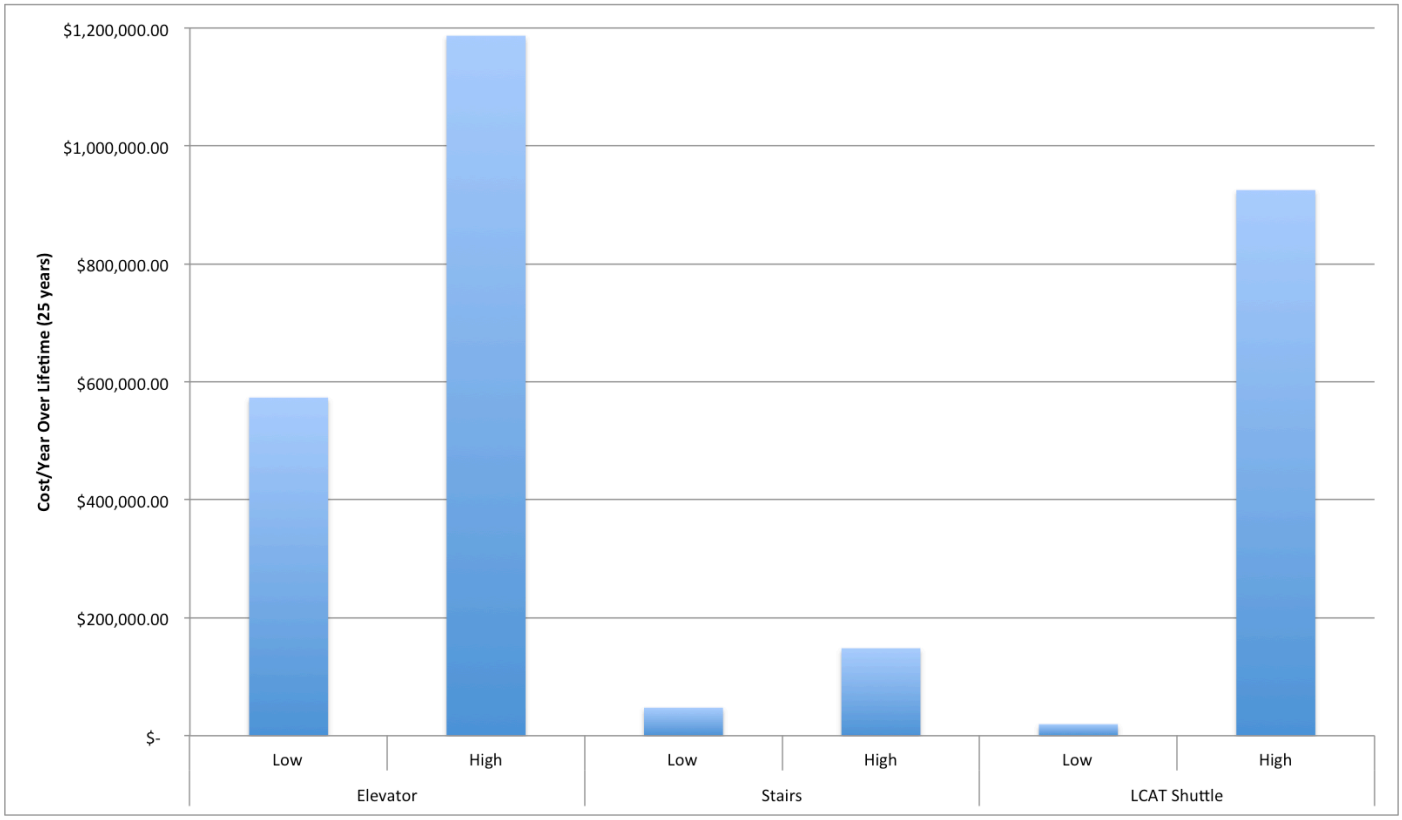
of the redesigned stairs. This was difficult, as contractors would not assess the reconstruction without a deposit or a greater assurance that this proposal would be realized. Because of this, the team needed to create their own range of estimates through research into construction costs. It was determined that there would be a variety of factors contributing to the costs, including: waste removal, material, bedding sand, delivery, clean up, labor, overhead costs, as well as a mark up due to the difficult terrain (Whittaker). These costs are seen in the chart below:

	Turfstone	Brick	Porous Asphalt	Eco Grid	Granite
$/Sq. Ft.	$6.00	$3.96	$0.75	$1.44	$4.24
Waste	$0.60	$0.40	$0.08	$0.14	$0.42
Taxes	$0.36	$0.24	$0.05	$0.09	$0.25
Bedding Sand and Road Base	$0.52	$0.52	$0.52	$0.52	$0.52
Delivery	$0.33	$0.33	$0.33	$0.33	$0.33
Clean up	$0.20	$0.20	$0.20	$0.20	$0.20
Basic Labor	$9.00	$9.00	$9.00	$9.00	$9.00
Basic Sq. Ft.	$17.01	$14.64	$10.92	$11.72	$14.96
Overhead fee (low)	$4.25	$3.66	$2.73	$2.93	$3.74
Difficult terrain fee (low)	$3.40	$2.93	$2.18	$2.34	$2.99
Sq. Ft. (low)	$24.66	$21.23	$15.83	$16.99	$21.70
Overhead fee (high)	$17.61	$15.24	$11.52	$12.32	$15.56

Difficult terrain fee (High)	$8.50	$7.32	$5.46	$5.86	$7.48
Sq. Ft. (high)	$43.11	$37.20	$27.89	$29.89	$38.01
Total Low	$361,327.34	$311,045.36	$231,925.19	$248,945.16	$317,946.81
Total High	$631,770.58	$545,077.51	$408,663.43	$438,008.20	$556,976.56

As seen in the chart above, the team determined that repaving the stairs would cost somewhere between $231,925 and $631,770. While these costs vary by material, they are relatively small costs compared to the size of the proposal. This means that economic considerations are a relatively minor factor in material choice.

While repaving the stairs is a significant cost for our proposal, there are a number of other costs that must be considered. Implementing a stone retaining wall, as recommended in our proposal, will cost approximately $120 per foot at a height of 4 feet. This would cost a total of $330,000 for our estimated 2,750-foot perimeter. Grading would also be a significant cost for the proposal, although the terrain and the magnitude of the renovations make estimating a total extremely difficult. In order to get a rough estimate for a total cost, the team used $100,000 for the low-end estimate and $400,000 for the high-end estimate. When considering the artistic component of our project, the size, material and artist can all vary greatly in cost, meaning that any estimates would be almost entirely conjecture. If this cost is not accounted for, however, the team is confident that the total upfront cost would not exceed $2,000,000. For the purpose of producing an estimate, the team included yearly maintenance fees of $10,000 for the low-end and $20,000 for the high-end, both of which are much higher than anticipated. Using annual worth analysis with an interest rate of 5%, the team determined the yearly cost to be between $50,000 and 150,000. For this analysis we used a lifetime of 25 years so this figure could be compared to the elevator yearly costs, however we believe our proposal will have a substantially longer lifetime. The chart below displays the estimated yearly costs for the three proposals. While we did not include a price for the artistic component in our estimate, it is still clear that the Art Stairs are the most economically viable option for revitalizing connections between Downtown Easton and College Hill.



Potential Funding Opportunities:

In order to finance any of these projects, significant work must be put into raising funds. The team imagines that the art stairs could be funded through a combination of school financing and state grants, as this is how the college has proposed to finance the Skyway Elevator. In order to receive money from the state, Lafayette College will likely need to apply for an Economic Development Administration Grant. To receive this, the school will need to fill out a variety of forms to prove that this project will enhance Easton's economic viability. The college can accomplish this by proving that the stairs will help to "fortify and grow industry clusters", namely the service industries located in Downtown Easton. Additionally the college can show that the stairs will "advance regional competitiveness" by becoming an attraction for Easton rather than a barrier dividing it in two. With the help of state grants the school could easily afford the renovations to the stairs.

The team would also have to petition the school for funding in order to finance this project. The best way to achieve this would be to fill out a Capital Project Request form, which can be found on the schools website. Through this the school can look at the project and begin to determine if they can raise funds to support it. There are multiple ways the school could go about accomplishing this. This project is in line with the goals of the college's current Live Connected Lead Change fundraising campaign. As stated in the campaign's mission statement "At Lafayette, we live connected. And because we live connected, we are prepared to lead change". The team determined three potential fundraising activities to help the school generate revenue for this project. The first option is to market the project as a senior or class gift. This way they could receive increased funding from a specific class. The second possible event would be an art auction, where community members, faculty and students would donate art pieces to be auctioned off to fund the development of the stairs. The final fund raising suggestion the team has for financing the stairs is replicating the brick donation system seen around the quad. Donors who meet certain thresholds will have their name engraved on bricks lining the renovated stairs. We believe that with these fund raising strategies, in addition to funding from the state, the college will easily be able to afford renovations on the third street stairs.

CONCLUSION

With consideration to the analyses and findings of the past 4 sections, the team recommends that the following actions be taken. These recommendations seek to address the goals stated in the introduction (Introduction) and to act as guidelines in future decisions made by the college.

The social contexts define the problem by three contexts: environmental/physical, cultural and psychological. These factors will decrease the time and money wasted of the project. The environmental and physical solution includes the solutions discussed in the Technical Analysis. To include the stairs into the culture of Lafayette College students need to be immersed to the path as soon as they reach campus through student led activities, examples such as first year orientation and community outreach programs. This will set into motion a notion that the stairs are as common as walking from the dorm to the dining hall to eat. The more activities the college can have down the hill will soon start a chain reaction to change the mindset of one graduating class to the next. This matters because the negative words used in regards to the stair experience is passed down by word of mouth through each grade, thus creating a negative connotation towards the stairs. This will be a gradual change through the years to make the stairs become as Instagram worthy as the football field, or a cultural attraction that is no longer a hassle. When the culture is changed the psychological aspects are diminished. These three contexts are a ripple effect of each other. If the technical side is fixed then the psychological mindset can be improved thus creating a culture of increased traffic. The stairs could be landmark that tourists come to view with the addition of art pieces and exhibits that incorporate the town and college-life activities. The technical, cultural and psychological factors blend together to create a solution for the stairs that will keep the atmosphere of Easton and increase traffic on the stairs.

In terms of the design process itself, we emphasize the importance of sustained stakeholder participation. As indicated by our Policy Analysis, stakeholders offer a range of converging and diverging opinions that have often been overlooked in previous solutions which oversimplify perspectives in order to move forward on a design. Participation must begin before a design is solidified and investment is made and must continue as the project moves forward. This process of integrating feedback can be understood through the practice of “deliberative political leadership” in which those in charge “integrate [community input] into their deliberations on the best way forward before making their final decision” (Lees-Marshment, 2016). Pending administrative interest, we propose a series of open forum meetings to develop addition ideas for stair revitalization. Meetings with representatives from the Arts Campus, College Hill Campus, Facilities Planning and Construction, Easton City Hall, the College Hill and Downtown neighborhoods, and the student population would be established at routine intervals following these open forums with the committee's design published for public comment after a consensus has been reached. This system aligns with our goals "to identify stakeholder positions and ways to leverage these into action and to "design a solution that aligns with the goals of the community and of campus.

While the technical analysis addresses how to rebuild the stairs to make them usable, the emphasis of the project is to provide further incentive for people to use the stairs more regularly in the first place. The Art Stairs are going to be a well-traveled pathway between College Hill,

Lafayette College's arts campus, and the center of Easton, so we want the new design to be a sustainable, durable, and enjoyable landmark to experience. Redesigning the structure with new and easily maintainable materials, as well as incorporating interesting features on the patios along the pathway will greatly incentivize, increase, and sustain community use of the stairs. People will finally see these stairs as an attractive destination, will be able to rest and enjoy the view, and not treat this place as an obstacle to overcome.

We believe that the best way to go about doing this is to first start by replacing the cracked, steep pavement pathway with Flexi-Pave and the precarious turns with large patios of Turfstone. We want the hill to be walkable so adding more stairs, lowering the grading of the pathway and creating more spots at which to rest addresses the undesirable conditions and inconvenience of exhaustion that many people express of the current Art Stairs design. It would be smart for the school to include the currently derelict pathway leading from the Art Stairs to Easton Hall in this project, to eliminate something that is currently an eyesore and to diversify community access of the stairs. Installing stone retaining walls or a more durable metal railing will promote a sense of safety when using the Art Stairs regularly. The installation of LED lampposts along the path would be a sustainable way to greatly increase visibility and enable people to safely travel up and down the stairs at any time they may need to. Ground-illuminating LEDs along the pathway could be a nice way to improve upon overall lighting and is an option worth considering. Appropriately landscaping the hill around the stairs after implementing the structural changes is a great way to improve upon maintaining erosion and making the rest of the hill nicer to look at and less of a pain to maintain. Space for statues, benches to sit on, books to read, and objects to draw or paint on are all ways to regularly involve the communities that use the Art Stairs.

Our Economic Analysis, outlines three major economic components of the Art Stairs. The first was the economic context of the Art Stairs. This was largely defined by Lafayette College and Downtown Easton's economic goals. Revitalizing the Art Stairs could help to enhance the economic viability of both groups by creating an attraction that facilitates connections between the two communities. The second major economic component of the Art Stairs was a cost-benefit analysis of this proposal as well as potential alternatives. Through this, we determined that the Art Stairs were the most efficient option as it had the best benefit to cost ratio. The final element of the economic analysis was determining sources of funding for our proposal. Through research of past proposals and meetings with a variety of community contacts, we determined that the Art Stairs could be funded with a combination of state and college money. The state money would come from an EDA state grant while the school could raise money through their Live Connected Lead Change campaign. After thoroughly examining these three economic aspects of our proposal, the team decided that the project was not only feasible but a project that would generate more money for Easton and Lafayette than it would cost them. The team determined that of all 3rd Street stairs proposals, the Art Stairs are the most economically viable.

Given the demonstrated benefits of the Art Stairs as a solution to the current commuting issues, we strongly recommend pursuing this project regardless of other action taken. The stairs are part of Lafayette's history and physical campus and cannot be left neglected. The structure as it exists poses challenges, but also holds a great deal of potential for increasing traffic between campus on College Hill and the downtown communities. Our design is intended to serve as the first iteration of a collaborative process to provide incentive for stair use.

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