Interdisciplinary Team Teaching: A Collaborative Study of High-Impact Practices

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LEARNING PLACES: Place-Based Learning in an Interdisciplinary Approach to Undergraduate Research

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Higher education teaching is an ever-evolving practice that responds to changing student preparation and learning needs, the contemporary needs of business, industry and the professions, research on teaching and practice, and the professional development of faculty. High-impact educational practices (HIEPs) outlined by the Association of American Colleges and Universities[i] (AAC&U) give faculty a toolkit of specific practices that current research identifies as having particular effectiveness in student engagement and learning in the 21st century. Included in this list of effective practices is *undergraduate research*, defined by the AAC&U as having the goal "to involve students with actively contested questions, empirical observation, cutting-edge technologies, and the sense of excitement that comes from working to answer important questions."[ii] While this high-impact educational practice is most often associated with the sciences, it has wider applicability to undergraduate learning where the methods of research can integrate synergistic strategies that further enhance student engagement and learning: place-based learning and interdisciplinary teaching. In this chapter, these two compelling approaches to higher education are presented as a powerful, interwoven and integrated approach to undergraduate research.

Place-based learning is an increasingly applied strategy in higher education to increase student engagement and put the students in the role of generator of knowledge rather than passive recipient.[iii] Interdisciplinary teaching is supported by scholarship that identifies specific benefits to the students,[iv] including gaining insights from multiple perspectives and increasing ability to integrate diverse concepts into a *contextualized approach to analysis.* The combination of these approaches to education requires more exploration of applications and techniques. Faculty need more guidance on how to teach effectively in an interdisciplinary format as well as outside the classroom using place as the context and content for learning. Here a specific course that does both is presented as a case study of successful practices and pedagogical approaches that will help the reader develop a similar course on their campus.

Learning Places: Understanding the City, is best described as a natural fit in an urban studies curriculum, where primary source empirical research methods are explored using the city as the laboratory. In the general education and liberal-arts context, urban studies courses make the city, or more broadly human settlements, the starting point for a broad range of investigations utilizing both interdisciplinary teaching and place-based learning. But in the case of this course, it is not within an urban studies program, but instead serving as an enrichment for undergraduate students across disciplines as one of a number of interdisciplinary courses offered as a general education core requirement. Undergraduate

students have much to gain from place-based learning focused on the built environment. Many disciplinary fields ranging from architecture and engineering to health, earth and social sciences to name a few have a direct or indirect link to the built environment, making this pedagogical approach an important addition to the study of these fields.

Urban environments in particular are growing more important to humanity due to a rapid urbanization of populations around the world. Population studies by the United Nations Department of Economic and Social Affairs indicate we are in the midst of a remarkable transition from rural to urban habitation[v], with the unprecedented scale and speed of this transition increasing pressure to research the impacts of this transformation of societies and guide this development with greater foresight. The current tension between the economic, social, and sustainable advantages of urbanization and the spread of diseases like the novel coronavirus in urban populations only increases the importance of the critical study of the potential of cities as the primary human habitat of the future, necessitating the inclusion of the urban habitat as a component of education and research across many disciplines.

While the course discussed in this chapter is focused on the city as the learning laboratory, the techniques outlined are applicable to other scales of human settlement that equally provide a rich and important laboratory for learning, including towns and villages in rural settings. While the world is rapidly urbanizing, the rural landscape is also going through significant change and the future of these places is unclear. Ecological sustainability, economic development, and social concerns pertaining to the future of smaller scale towns and villages are equally potent topics for undergraduate research and are actively contested questions in the 21st century. In these places the use of place-based learning strategies combined with interdisciplinary teaching are no less useful than the city[vi]. Overall the pedagogical strategies and teaching techniques presented here offer a broad range of applicability that can be of service to faculty in a range of contexts seeking to apply the high-impact educational practice of undergraduate research.

OVERVIEW:

Challenges for Undergraduate Research

Undergraduate research presents faculty with a number of challenges depending on the study skills, previous knowledge and experience the students bring with them into the classroom. Likely, students' past research experiences have centered on review of secondary sources where they are learning about and compiling others' research on a topic. These experiences often lead to a rote, performance goal approach to writing research papers, where students seek to meet the word count and provide the minimal number of citations required. Parallel to the rote process, students' selection of sources is often poor, especially in the age of easy access to information. If the students have not developed information literacy skills, they tend to follow the easiest path toward meeting the requirements of the paper. Both of these tendencies result in writing where the student's voice, their observations and insights, their critical statement, research question or thesis on the topic, and/or any significant conclusion or findings are often missing or superficial.

Seeking an approach that would facilitate meaningful research but also maximize accessibility to a diverse range of students, experiential learning and empirical observation[vii] were selected as key features of the research in the course presented here. While students in a science lab are asked to use observation skills, most students are not practiced at applying empirical observation to the physical and natural world they see and experience every day. Therefore, a central goal of this course is to change the way they see, to leverage all the power of thinking and learning that comes through their experience as well as purposeful and careful observations. This approach taps into the students' often overlooked skills of visual thinking and learning. Visual thinking and learning stand apart from the usual text-based focus of research and present students with a valuable alternative.[viii] Together, these strategies offer great potential to help students overcome the impact of intimidating research experiences of the past and presents them with an accessible access point for a different approach to research.

Benefits of an Interdisciplinary Approach to Teaching Undergraduate Research

Interdisciplinary teaching provides specific benefits to courses focused on undergraduate research. First, it brings multiple perspectives to the research topic. Second, it presents students with a broader range of expertise and guidance as they develop their research. Interdisciplinary teaching manifests and reflects the complexity of research topics, helping students move beyond a narrow understanding of the problem they are considering and place the problem in a context that helps them deepen their view of it. Kevin Francis and co-authors discuss the specific benefits of interdisciplinary learning where the students experience real-world complexity of problems and the need to explore them both broadly and deeply.[ix] They point to collaborative teaching where faculty are working together across disciplines to solve problems as modeling the desired behavior and process for the students. Interdisciplinary teaching can also bring specific disciplinary knowledge combinations to bear on the problem at hand and support the student research process.[x]

Place-based Learning's Critical Reframing of Undergraduate Research

In addition to bringing interdisciplinary examination to the research, the application of place-based research offers students an alternative experience of research that can have significant benefits. Healy and Jenkins argue that undergraduate student participation in research and inquiry is any opportunity to transform students from consumers to producers of knowledge.[xi] Their argument dovetails with Gregory Smith's view of the central benefit of place-based learning[xii]. Place establishes for students both a real-world context as well as an experiential component for their research. Topics for research, rather than being ethereal and distant, can be selected for their relationship to a specific place or places and vice-versa. Kevin Francis and co-authors note that using place allows the definition of a study area that helps students limit and focus their research efforts.[xiii] Visits to the selected place(s) facilitate a first-hand relationship to the topic that differs from classroom research experiences that might quickly move into internet searches.

Going further, first-hand experience of place as the critical context *and* content of the research brings the students into a direct relationship with the research topic. This establishes the potential for empirical observations as the foundation for the research process rather than reliance on secondary source information. In this way, place can serve as the central, primary source for the research. Here place serves the same role as the specimens in a biology lab, or the studied behavior of animals in the wild, or the shifts of light in distant objects in space. All of these research objects require careful observations and documentation as a critical activity.

Making place itself the focus of research is supported by a number of scholars examining both place itself and approaches to inquiry of the natural and built environment. Chanthou Thoeun discusses how education at its fullest potential is linked to our sense of place and our place in the world, our link to the larger system and organism of a city or town or countryside.[xiv] In an information world where virtual is competing with real, placelessness is a growing concern, with young people in particular growing disconnected from place. This disconnect has multiple impacts on their lives and their relationships to both the human and natural world around them.[xv] Smith and Sobel share this concern, where the digital age tends to cut off the relationship to the world around us, to the natural and built environments that impact our lives at a fundamental level, and degrades a sense of community and human relations.

Critical to Thoeun's discussion of place-based research is the emphasis on a systems thinking approach to undercover multifaceted aspects inherent to a specific environment, a common aspect of many scholars application of inquiry to place[xvi]. Anderson and Johnson's outline of the principles of systems thinking includes looking at the whole, recognizing complexity and the interconnectedness within systems, and seeing ourselves as part of a system. These principles both raise the challenge of place-based learning, making sense of dynamic and complex problems, but also its benefit: making explicit the students' inclusion and position in the system they are investigating is a potent strategy for engagement.

Charlane Starks focuses on the multicultural viewpoints tied to place, where place-based learning assignments that examine students' neighborhoods allow the students to bring their own perspectives and social contexts into the research, at the same time building levels of engagement but also reflective learning[xvii] based on the opening up of new knowledge connected to a familiar environment not previously examined or taken for granted. Study of place offers students a path for understanding social structures and how they connect to civic and built environment structures, including housing, transportation, public space, civic and commercial centers. All of these then open the door to issues to racial and demographic integration or isolation, inequality and social justice, environment and health. David Gruenewald sees this as a natural effect of place-based learning: that as it focuses attention on political and economic impacts on local communities and their environment it encourages a critical pedagogical approach that challenges cultural and education assumptions.[xviii] This critical pedagogy component of place-based research is proving especially engaging to students from disadvantaged and underserved populations. In this way, this approach is showing success in helping achieve the AAC&U LEAP initiative of "making excellence inclusive."[xix]

Requirements for Undergraduate Research to be Counted as a High Impact Educational Practice

The AAC&U research on undergraduate research finds that for it to have the impact on students the research must be relevant and bring the students in contact with significant real-world problems, such that it generates an excitement and engagement in the students, thereby having a higher impact on them than a research experience that does not do these things. The specific piece of the AAC&U's definition that is applied in this approach is the goal "to involve students with actively contested questions, empirical observation, cutting-edge technologies, and the sense of excitement that comes from working to answer important questions."[xx] Smith and Sobel see place-based learning specifically supporting the high impact aspect of undergraduate research as it is demonstrated to improve student engagement in the same way undergraduate research does by helping students derive meaning through their efforts to help address real-world problems.

The empirical observation required in the research of place is one way place-based research specifically meets the requirements of high-impact education practice of undergraduate research. Another way place-based research meets the requirements is that it involves the myriad social, economic, scientific, and political issues connected to the built and natural environments. Many current critical issues in society are tied to place: social and environmental justice, sustainability, urbanization and environmental degradation, bio-diversity and human health, urban density and disease, carbon-footprint and climate change, historical reassessment, gentrification and displacement. Research of place that explores these issues meets the HIEP requirement of addressing "active contested questions" in undergraduate research. The type of problem solving and flexible, creative thinking that will be required of future generations as they face social, economic, and cultural upheaval is facilitated by the study of place and environment. The 2020 pandemic is a case in point, with extreme disruption of place and daily lived experience. This disruption raises fundamental questions of how we live and the importance of social interaction in daily life. It also raises increased understanding of "home" as the foundational place in people's lives, a foundation many in our society have a tenuous hold on or are lacking altogether.

Higher levels of student engagement are the core goal of the AAC&U initiative. When places are selected for research adjacent or near the community where students study, work, and/or live, they are already engaged in the place even if only at a basic level. If the place is well selected, it can begin the process of engaging the students at a higher level as they discover or come to understand the critical issues tied to the place, especially when the issues relate to their life experience. For example, minority students may engage at a higher level when issues of racial displacement due to gentrification are raised through the study of a particular neighborhood. [xxi] Students studying environmental sustainability will likely engage at higher levels when they examine the multiple impacts of human development on a place and how it functions through an environmental lens.

In addition to level of engagement, undergraduate research through place-based learning has strong potential to address two of the Essential Learning Outcomes identified by the AAC&U: "knowledge of human cultures and the physical and natural world", and "intellectual and practical skills including

inquiry and analysis, critical thinking, oral communication, information literacy, and teamwork." When students study places infused with the imprint of multiple generations and cultures and the way communities interact and are impacted by changing conditions, their research builds their intercultural knowledge. Inquiry and analysis along with critical thinking are all active and central strategies in place-based learning. As presented here, the research approach also requires specific attention to the development of information literacy, while the mode of presentation is purposely oral and team-based rather than individual written papers. This combination of strategies aligns this approach to undergraduate research closely to the AAC&U Essential Learning Outcomes.[xxii]

Types of Place that are Particularly Useful for Research to a Broad Range of Students

The course offered as a model here uses New York City as its laboratory. While this is not a limiting factor for the broader application of this approach to undergraduate research, the built environment is the common denominator of the type of place that works well with this approach due to its high potential for student engagement based on lived experience. The built environment includes the students themselves in the context, where a natural site alone may or may not speak to their lived experience. Place of course means different things depending on geographic location. Encouragingly, Smith and Sobel reinforce the potential of place-based learning in any context, rural or urban, with strong applicability to both more natural settings and the heavily built environments of urban places.[xxiii] Understanding the potential of a place to be a rich laboratory for learning is the key to the selection. The richness then offers a range of topics that students can consider for their research, where each student (or team of students) can select, with careful guidance, a topic that speaks to their interests. It is typical for the early days of the semester to be filled with doubt when the students from majors like law or nursing or hospitality learn that they will be studying the built environment, but student reflections at the end of the semester reveal that they finish the semester not only engaged at a high level, but also that they particularly appreciate the course on multiple levels and came to see how the research was relevant to their own discipline and general education.

Learning Places is designed to bring undergraduate research as a high impact educational practice to students from all disciplines, integrating compelling research supported strategies. It is discussed in greater detail below in the hope that it provides faculty at any institution an inspiration and guide to adopting a similar approach in and out of their classrooms.

LEARNING PLACES as a MODEL APPROACH:

Faculty Teams and Site Selection

Each semester the faculty team for the course forms, usually consisting of two to three faculty members from different departments. The core faculty teams teaching this course come from the Library and Architecture faculty, but faculty from a broader range of disciplines join up to teach the course, including faculty from Hospitality, History and Psychology. The team selects the site for the course based on the potential research avenues, availability of key primary sources, and major and minor topics

associated with the site. Access to the site itself is also central in the selection process. As this course was developed for students studying in Brooklyn, New York, the sites utilized for the course have ranged from nearby public housing estates, industrial waterfronts, historic neighborhoods, contemporary development projects, as well as business and civic centers. Important historic structures like Grand Central Terminal have served as places for investigation, as have historic industrial sites like the Gowanus Canal, a superfund site with a legacy of environmental degradation. Contemporary development sites like Atlantic Yards and Metro-Tech in Brooklyn that have had an impact on historic fabric and existing communities are also common subjects for investigation as the evoke questions of how and why places change.

Student Learning Goal/Objectives

The faculty consider each site for its potential to facilitate the course's identified student learning goals that integrate general education skills with cross-disciplinary research skills. The central learning objectives for this course are:

- Utilize skills in inquiry/analysis to derive meaning from experience as well as gather information from observation
- Comprehend factors inherent in complex problems
- Understand the cultural, social and economic processes that guide the physical development of the built environment
- Develop, purposefully connect and integrate/synthesize knowledge across discipline knowledge and skills to solve problems
- Demonstrate and apply information literacy aptitude by gathering, interpreting, evaluating and applying information discerningly from a variety of sources
- Think critically, communicate effectively, and work collaboratively
- Become flexible thinkers
- Develop a methodological approach to research

This course's strategy for enhancing undergraduate education starts by helping students develop their ability to utilize inquiry and analysis to derive meaning from experience as well as gather information from observation. Analytical investigation propelled by careful observation lies at the core of the learning objectives. Faculty bring students into intimate relationship with the place itself as well as the key primary materials that shed light on the nature of the place and reveal rich topics for further investigation. Careful observation is a widely accessible skill, offering undergraduate students from broad backgrounds an underappreciated foundational research tool. With guidance by the faculty, observations serve as the first level research material driving an analytical process that sets up an engagingly direct and unfiltered[xxiv] research experience.

Analysis of observations of the built environment facilitate recognition of its complexity. This complexity is rooted not just in design and construction but in myriad human factors including cultural, social, and economic processes. While the complexity may seem overwhelming for undergraduate students, the

grounding of the research in their lived experience and their perceptive observations paves a path towards confidently managing the complexity and selecting the key issues to research in greater detail.[xxv]

The foundation of analysis of the direct observations facilitates the development of knowledge that can be purposely connected and integrated across a range of disciplinary perspectives shared and nurtured by the faculty, where each discipline links to specific types of sources of information (buildings, streets, neighborhoods, public space, maps, design drawings, photographs, reports, demographic and real estate data, newspaper articles and contemporary accounts) as well as methods of interpretation. The potential range of disciplinary perspectives brought into this course is broad (architecture, urban design, library and information science, historical analysis, social science, economics, psychology, art history and aesthetics, law, human services, urban tourism…) allowing a variety of combinations of interdisciplinary teams. When the faculty team consists of an architect and a librarian, observations of the architecture and urban design bring significant qualities, characteristics, and nuances of the built environment to light while primary source materials linked to the architecture and urban design are investigated through an information science perspective, starting with the evaluation of the sources and their purpose, authorship, and value to the emerging research topics. This guidance in the initial stages of investigation helps students to develop and apply information literacy aptitude by gathering, interpreting, evaluating and applying information discerningly from a variety of sources. This objective is especially important in an age of information overload where the skill of evaluating sources of information is critical.

Place-based Learning Strategies

The structure and assignments of the course have varied over the three years this course has been offered, with experimental strategies tested for their effectiveness in supporting the students' research. The strategies presented here reflect the insight gained from a number of approaches to the assignments and course structure.

Neighborhood Analysis

At the start of the semester, a short individual assignment provides a scaffold for the research methods to be developed throughout the course, with a focus on mapping, observing, and searching for primary source materials. Students are asked to investigate their neighborhood through the following methods:

- Map the boundaries and important social or spatial center(s) within the neighborhood
- Use available GIS data-bases to generate some basic graphic analysis of the neighborhood, such as the differentiation of uses of the buildings or demographic makeup of the population
- Search for at least one historic artifact or document that gives a deeper understanding of the neighborhood (map, photograph, monument, work of art, contemporary account…) and document the source in a formal citation

- While on site, use a voice recorder or video to document observations of a key location in the neighborhood

This low-stakes research assignment is then compiled and presented in a five-minute audio/visual format. This assignment allows the students to practice their use of the tools for research. Using their neighborhood for this first step is purposeful, as it has meaning to each student, helping them engage with the methods and tools. It also helps them take the first step of seeing a familiar environment in a new way, likely with greater depth and understanding. The students regularly reflect on this point, as they did not give much thought before to the nature of the built environment they move through every day. The experience of discovery and the awareness of its personal relevance to the students starts a process of engagement that student reflections confirm grows throughout the semester and has a discernable impact on them.

Figure 1. Example of neighborhood analysis

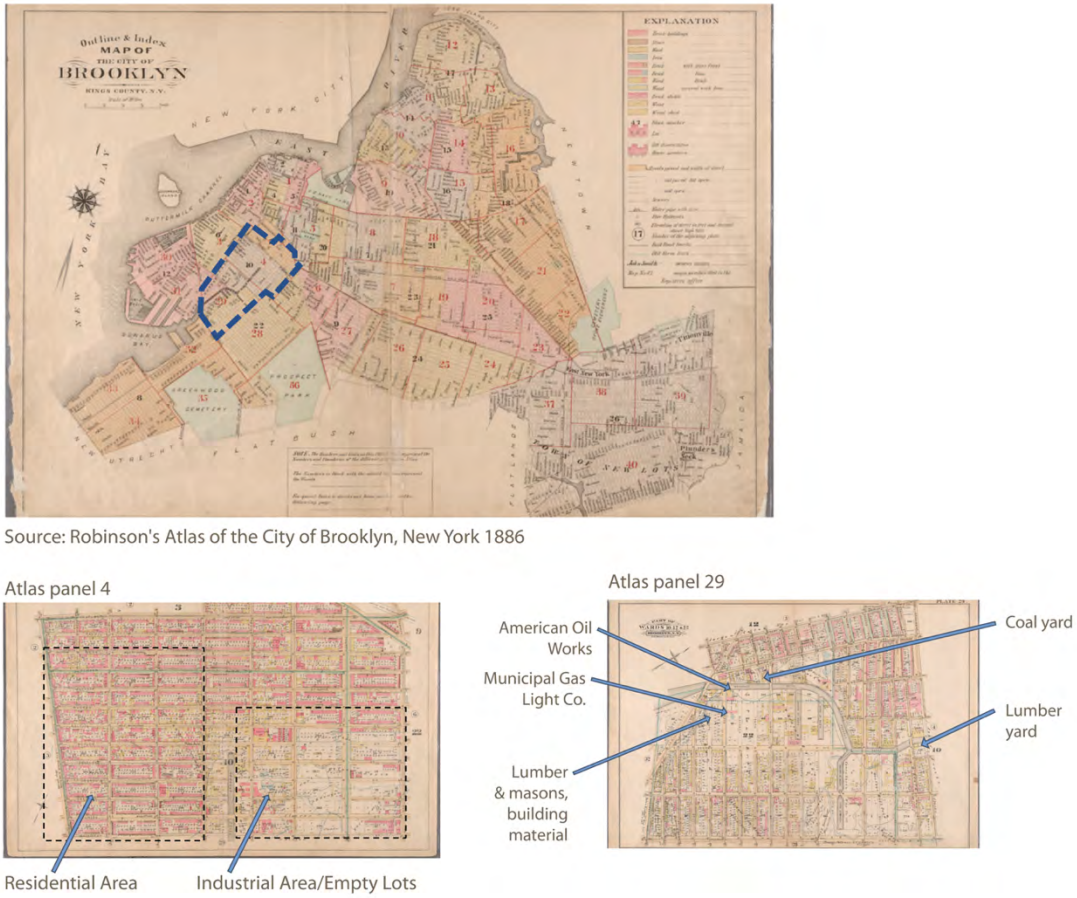
Film Series

As a transition from this initial exercise and the primary research project, three documentary/ case study films are used to provide deeper and broader perspectives of the importance of the built environment to a range of social, economic, and cultural issues. The first film focuses on the forces of development and their impact on existing communities. This film, *My Brooklyn*, documents a vibrant commercial center in Brooklyn and the imposition of change by heads of business and government that see a development and profit opportunity. This film vividly captures divergent views of place that are grounded in racial perspectives. It also captures the social insensitively and injustice that is a common by-product of "top down" development. The second film continues this theme in the context of urban planning theory and history. *Citizen Jane* not only chronicles the ideological battle between Jane Jacobs and Robert Moses for the future of New York City, but also provides in Jacobs, who without training or formal education in architecture or urban planning, emerges as an exemplar for gaining deep understanding of the complexity of the built environment through careful observation. The final film, *The Human Scale*, provides a series of international case studies of the design and development of the built environment and its human impact. This film, centered on the work of the Danish architectural practice led by Jan Gehl, examines how the built environment can either support social interaction or

lead to social isolation, both through the design of the public realm but also through the nature of housing development and urban structures. Together, these films help students from diverse backgrounds and a wide range of disciplines further appreciate what they began to understand through the first assignment but also build the theoretical foundation and historical perspective that supports a critical examination of the site selected for the research project.

Initial Site Investigation

With the skills acquired and practiced in the first assignment, students form into teams of two to begin their investigation of the place selected for the semester's research. This investigation begins with a geographic analysis of the site using online sources including Google Earth and historic maps available online through local libraries, map collections, and the Library of Congress. Using these tools, the site area is clarified and its primary geographic characteristics defined. Combining contemporary and historic maps in this analysis allows students to visualize and document change in the study area through close observation. This change is often the touchstone for further investigation and research.[xxvi]



Source: Robinson's Atlas of the City of Brooklyn, New York 1886

Figure 2. Student analysis of study area using historic fire atlas

The geographic analysis is followed by a series of walking seminars, with the faculty team guiding the students to and through the site with frequent close examinations of particular conditions along the way. These examinations utilize a Socratic method with probing questions guiding deeper levels of observation that help students engage with the discussion and the nuances of the place. The starting point is a general question of "what do we see here?" The subjects of observation include all facets of the place, from the natural flora/fauna to the nature of the human presence to the quality of the physical spatial setting to the architectural characteristics including materials, details, and proportions. The students document their observations using photographs, videos, and voice memos.

The voice memo, in particular, is a highly effective tool for documenting observations as it allows students to look without hinderance while they record their observations in real time. This process also fosters a critical examination, moving past the superficial characteristics of a place. For example, student observations of a closed off street that is part of late 20th century urban re-development project include the overt and subtle cues that it is not a friendly or welcoming place despite being next to a high school and a university campus, with "back of house" functions serving the institutional buildings, high security presence for government buildings, and a lack of pedestrian friendly pathways and poorly maintained grounds. Students demonstrate their levels of engagement and inquiry/analysis by noting comprehensively what they see but also what they don't see, and then asking questions to probe further.

To further enhance student observations in the field, students are given a short workshop on sketching and visual note-taking and encouraged to use these skills as another method of site investigation. The workshop uses a didactic method, where students first draw a place without input, then re-draw the same space after a discussion of careful observation and techniques for drawing in perspective. With this minimal training, students are able to apply visual note taking in the field.

Figure 3. Tutorial on observational sketching (left)) and application in field (right)

In addition to observing the site carefully, conversations with local residents, business owners, community representatives, or historians are coordinated to let students hear the voice of stakeholders and to provide the opportunity for the students to build on their documentation and research through direct interaction and conversation. A recent walking seminar to the Gowanus Canal included a visit to a wood shop where the students could discuss with the owner the challenges of maintaining a business in a neighborhood transitioning from industrial to residential mixed use. Another walking seminar included a member of the local conservancy that guided the students through environmental design features being implemented in the neighborhood.

Through these modes of observation, discovery, and initial research the students develop the basis to form hypotheses about the place, including its chronological development, the how and why it is used in a particular way, the nature of the access to the place, the makeup of the local population, its environmental challenges, the political, economic and social forces that formed the place, the way the place fosters or hinders social vitality and diversity, how the contemporary place relates to other comparable places or the historic condition within the study area.

Figure 4. Walking seminar examining bio-swale near Gowanus Canal

Primary Source Research that Compliments and Deepens On-Site Investigation

This first phase of research on site provides direction for the next stage of research, which focuses on primary source materials that shed light on the initial research question and hypothesis. This research makes use of online sources along with guided visits to local libraries, archives, and historic societies. Particularly useful materials include historic maps and photographs, demographic data, government reports, environmental impact reviews, GIS data including data on health, use, traffic, property lines, building footprints, materials now commonly found both in hard copy form but also digitized and available online. With these materials in hand, the students expand their analysis and revise their research question and hypothesis.

Interestingly, the local research institutions become additional places of experience for the students where these guided primary source research experiences are clearly having profound impact on the students in a number of ways. First, the experience helps them appreciate the power and accessibility of primary sources for research. Second, the sense of scholarly activity that these experiences facilitate helps students focus and reflect on their own scholarly development and growth. Third, many students may not feel naturally welcome or comfortable in these institutions, believing they are for other people. Helping them gain comfort and come to understand their right to be in these places is not to be underestimated as a powerful part of the undergraduate research experience.

The observations, documentation, primary sources and revised question/hypothesis for each team are consolidated at the mid-term into an audio/visual presentation. For the study of Metro-Tech in Brooklyn, research questions focused on a range of issues including examining the economic outcomes against the projections made prior to construction, exploring if the developer balanced social justice concerns in the development project, looking at the impact of transportation infrastructure changes on social and economic vitality of the neighborhood to be re-developed. Feedback is an important component of HIEPs, and *Learning Places* is designed to encourage presentations where immediate feedback and group discussion can help focus and deepen the research work. This approach to the first two phases of investigation builds the depth of the research through a clear series of guided steps and prepares the students for the final project development.

Figure 5. Students huddle around historic map at the Brooklyn Library Brooklyn Collection

Final Project Development

At this point each team of two is joined with another team based on the potential of combining the various research threads and hypotheses, resulting in teams of four that will stay together through the remainder of the semester. At this stage, the most formal components of the research process come into focus, with a clear research question and consolidated hypothesis, a research outline, and an annotated bibliography. Each of these components is critical to the success of the research, so significant time is allocated for faculty interaction with each team to monitor the progress and give intensive feedback.

The experience gained from the three-year history of this course reveals the central importance of the annotated bibliography to the students' learning and to the success of the research project.[xxvii] The compilation of the list of sources is reviewed to ensure its relevance to the team's research question and hypothesis, as well as the quality of the sources. Here faculty work closely with the students to emphasize that much of the body of the final research presentation comes directly from the annotations. As part of the feedback other sources or research avenues are recommended for potential

inclusion. Student teams are then encouraged to operate more independently as they pursue additional sources, visiting libraries and archives on their own to focus in on particular research materials they need to add to the bibliography to round out an argument or provide additional clarity and evidence. This is an important moment, where the students take ownership of their team's research and have genuine independent research experiences, with the confidence, skills, as well as clarity of procedure built through the preceding scaffolded exercises.

Final Presentation of Research

The final presentation of the research takes the form of either a podcast or a multi-media presentation. This strategy aims to accomplish important goals at this stage of the research experience: to keep the voices of the students in the foreground, to avoid plagiarism and pro-forma rote regurgitation of other's research, and to free the students from the "straightjacket" of the student research paper. At the same time students are cautioned against a common outcome in the early iterations of the course, where the podcast dialogue fails to live up to the rigors of the research, and becomes more an expression of student opinion rather than a scholarly assessment. Nonetheless, this change of form and medium has a critical impact on the resolution of the research experience. Student teams are encouraged to creatively conceive of the genre or approach to their presentations, a process that helps them formulate how they can best present their research and conclusions while staying within a comfort level where they can speak confidently and their voice and knowledge is documented and shared. For example, a highly successful team used the popular Jeopardy format, making use of an available online tool to follow the game's format and use the answers and questions to present their research findings. The team used the typical banter after each question to allow them to debate the finer points of each sub-topic raised in that question.

Once each team decides upon a genre or organization of the presentation, they develop a script where each team member plays a voice or role. For the students, the script writing differs substantially from a formal research paper, freeing them from any hang-ups or hesitations centered on form, content, or style. They then begin a recording process where the tracks are edited and complied by the team using audio editing software such as Audacity[xxviii]. If desired, movie editing software adds the visual and additional audio components, including video from the site, still photos from the site or from their research, maps and diagrams, and voice memos of their on-site observations.

Listing to the podcasts and seeing the audio/visual presentations produced by the students is a revelation. First and foremost, you hear the students' collective voices, not other authors, navigating their own curation of the sources. Second, the analysis and conclusions are the product of this process, not taken from other scholars' views and findings. Third, you hear and see the impact of place-based investigation, where students synthesize the complexity through systems thinking. Finally, you hear the relationship the students have with the place, through their application of a basis of their lived experience combined with their experiential learning in this place. You hear engaged critical thinking presenting original research that concludes an authentic and meaningful research experience. Even

where the analysis and findings are less complete or impressive, the product still exceeds typical student research papers in its directness and genuine reflection of original student research.

This slide was made to help me show the street and block changes by using diagrams that illustrate clearly the negative impacts street changes had. The 1924 map that was taken from the maps.nyc.gov "then and now" maps. This map helped me see the changes of the blocks and street widths as well as streets that were removed. In the 1924 map I have highlighted the pre-existing streets that were dramatically changed with a dashed green border. Then I took those green highlights into the 2018 map to over lay it on top. That way I could compare the changes and see the amount of street that were removed or added from the pre-existing street to the existing condition streets. The 2018 map was used to create a diagram that showed the communal area, restricted area, backstreets and major streets.

NYC Then & Now. (1924). Retrieved from https://maps.nyc.gov/then&now/

Figure 6. Sample of annotation in the team annotated bibliography

Assessing Student Achievement through Student Feedback and Reflections

Student reflection offers a powerful assessment of the efficacy of this approach to undergraduate research. One important reflection is based on the students' experience of the collaborative teaching in the course. The students state that successful collaborative teaching requires faculty teams to manage the process such that students are receiving direction and feedback that is clear and not contradictory.

While the students recognize the different perspectives the faculty bring to the course, they do not want to be steered in divergent directions that will frustrate their progress. This is consistent with Francis and co-authors stress on faculty working together closely with the students to model interdisciplinary collaboration.[xxix]

The other important reflection is on the general impact of this course on the students. Here it is not uncommon for students to express their hesitancy to engage with the course at the beginning of the semester and reflect on how that changed as the semester progressed. Students often register for a common core course based on criteria that is not centered on the course description. Therefore, the first day of class in *Learning Places* is often a bit of a challenge, hearing about the focus on the city and the disciplines of the faculty, placing the students in unfamiliar territory. Two recent student reflections talk to this point.

> *Student 1 Final Reflection:*
>
> I really didn't know what to expect my first day of Learning Places class. I said to myself "Understanding the City", ok I can work with this, then I heard the word architecture, and suddenly I wasn't too sure anymore. I was aware of the architecture major students in class and now I'm thinking "those architecture students got one up on me, should I stay? or maybe leave and try again another time." I was unaware that it WAS my time, and I'm so happy I stayed. Starting off with taking daily tours of the downtown, Metro-Tech area I gradually started to get a glimpse of what direction the professors were trying to go with the class. Then, moving forward with the case study neighborhood analysis of my neighborhood was like unveiling important facets of researched facts about my neighborhood that was always right there in front of me, but now uncovered. Honestly, I'll never look at my neighborhood the same because of this class, let alone the Brooklyn downtown and Metro-Tech areas. My vision is clear to the information, insight, and knowledge in reference to these places since taking this class. Both professors, with their diverse style of teaching the class made me want to push myself, and dig further into my research assignments.
>
> *Student 2 Final Reflection:*
>
> I had no idea what this class entailed until I actually showed up on the first day. I just took the class because it fit into my schedule. When I got to class and realized that it was about studying neighborhoods, buildings and the like, I made up my mind to drop it the same day. My first thought was, "this has absolutely nothing to do with my major (Legal Studies), so I'm out." By some act of fate, I was unable to find another class and decided to go to the second class meeting. This is when I met Professor Phillip and somehow she made the coursework seem a bit more manageable. We did our first voice impromptu observation memo, and as hard as it was, that was what motivated me to stick with the class for the rest of the semester. I can honestly say this class

> forced me out of my comfort zone, pushed me to learn new things and bond with my classmates. I am more aware of the changes taking place in the city and city planning. My vocabulary has been expanded tremendously with terms I've learnt in this class. Believe it or not, I even see where there were overlaps with this class and some of my legal classes. For example, the changes in zoning laws over the years. I recently did a presentation in my Real Estate Law class about zoning laws and thanks to this class, I was able to apply my knowledge about Metro-Tech to make arguments. Indeed, this class was not what I expected, and I am quite happy about that.

Conclusion

The AAC&U report cites William Cronon's essential view of liberal education: "more than anything else, being an educated person means being able to see connections that allow one to make sense of the world and act within it in creative ways."[xxx] The broad accessibility of place-based research in an undergraduate setting is a critical component of this approach to engaging undergraduate research. While the typical image of undergraduate research is a motivated STEM student working closely with a scientist in the lab, the approach presented here is seeking to do two things: first, bring the built and natural environments into the minds of undergraduate students as important context and subject for examination and research; second, to engage students in a highly viable and tangible research process that motivates student away from performance goals towards learning goals.[xxxi] These goals foster continued growth by providing a clear methodology the students can apply to other research work in their education to make it more engaging and meaningful to them. Student reflections confirm the findings of the NSSE survey, where they claim undergraduate research experience in *Learning Places* to be a life-changing experience, where they now see things they never paid attention to before, that it has deepened their learning and given them a sense of control and confidence in their abilities to "take measure of events and actions and put them in perspective", helping them see themselves in relation to and connected to the larger world around them in a new way. [xxxii]

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Endnotes

[i] See Kuh, G. D., Schneider, C. G., & Association of American Colleges and Universities (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities. as well as the updated list:https://www.aacu.org/sites/default/files/files/LEAP/HIP_tables.pdf

[ii] ibid, 10.

[iii] For succinct discussion of the benefits of place-based learning, see Smith, Gregory A. "Place-Based Education: Learning to Be Where We Are." *Phi Delta Kappan Magazine* 83, no. 8 (2002): 584-94.

[iv] For example, see Francis, K., Henderson, M., Martin, E. *et al.* Collaborative teaching and interdisciplinary learning in graduate environmental studies. *J Environ Stud Sci* **8,** 343–350 (2018) doi:10.1007/s13412-017-0467-0

[v] According to a UN report, over a 100-year period (1950-2050) projections indicate that the world population will flip from 2/3 rural to 2/3 urban. See *Department of Economic and Social Affairs. World Urbanization Prospects: The 2018 Revision. New York: United Nations, 2019. https://doi.org/10.18356/b9e995fe-en.* This report precedes the 2020 pandemic, which may have an impact on these projections.

[vi] In fact, the notion of place-based, experiential, inquiry-based learning is rooted in environmental studies. The application to urban environments is an adaptation of this pedagogy. For more discussion, see Gruenewald, David A. "The Best of Both Worlds: A Critical Pedagogy of Place." *Educational Researcher* 32, no. 4 (2003): 3-12.

[vii] Based on the principles of John Dewey, found in: Dewey, John. Experience and Education. 1st Touchstone ed. Kappa Delta Pi Lecture Series. New York: Simon & Schuster, 1997.

[viii] John Berger notes "seeing comes before words" while Rudolph Arnheim makes the argument for the power of visual thinking that has its own processes and analysis distinct from cognitive thought. See Berger, John, Blomberg, Sven, Dibb, Michael, Hollis, Richard, and Fox, Christopher John. *Ways of Seeing*. Penguin Art and Architecture. London : London ; New York, N.Y.: British Broadcasting ; Penguin Books, 1977. p.1 and Arnheim, Rudolf. Visual Thinking. Cal 227. Berkeley: University of California Press, 1971.

[ix] Deep learning about a specific problem is often discipline specific while the broad learning is where many disciplines are brought to bear on a complex problem.

[x] This can include the specific goal of building the students' information literacy to improve the quality of the sources examined during the research work.

[xi] Healey, Mick, and Alan Jenkins. *Developing undergraduate research and inquiry*. York: Higher Education Academy, 2009.

[xii] Smith, Gregory A. "Place-Based Education: Learning to Be Where We Are." *Phi Delta Kappan Magazine* 83, no. 8 (2002): 584-94.

[xiii] They note that student research often fails when the research topic is too broad or ill defined.

[xiv] Thoeun, Chanthou. "Situating systems thinking between past & future: Hannah Arendt's discourse on the multicultural 'world'." *Multicultural Education* 21, no. 1 (2013): 8. *Gale Academic Onefile* (accessed December 16, 2019). In this article Theoun draws upon Hannah Arendt's observation of growing placelessness in the 20th century.

[xv] Thoeun discusses the concept of de-placement. De-placement impacts: "The loss of a common sphere among humans presents a pressing concern for Arendt because the loss signals the sense of "de-placement" that Orr (2004) speaks of. The loss of place results in the loss of a common sphere, and vice-versa as humans fail to connect with one another in terms of values, beliefs and practices."

[xvi] For example, see Gosselin, David, Steven Burian, Tim Lutz, and Julie Maxson. "Integrating geoscience into undergraduate education about environment, society, and sustainability using place-based learning: three examples." *Journal of Environmental Studies and Sciences* 6, no. 3 (2016): 531-540. See also Keane, Linda, and Mark Keane. "STEAM by Design." *Design and Technology Education* 21, no. 1 (2016): 61-82.

[xvii] Starks, Charlane. "Connecting multiculturalism, sustainability, & teacher education: a case for linking Martin Luther King streets & the power of place." *Multicultural Education* 21, no. 1 (2013): 33. *Gale Academic Onefile* (accessed January 9, 2020).

[xviii] Gruenewald, David A. "The Best of Both Worlds: A Critical Pedagogy of Place." *Educational Researcher* 32, no. 4 (2003): 3-12. Accessed January 10, 2020.

[xix] Kuh, G. D., Schneider, C. G., & Association of American Colleges and Universities (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities. p.3.

[xx] ibid, 10.

[xxi] It is also important to consider that in the case of City Tech, a Hispanic Serving Institution (HIS) and majority minority college, place-based research is proving accessible and meaningful to a broad range of students across many disciplines.

[xxii] The National Survey of Student Engagement (NSSE) that grounds the HIEPs research documents the benefits of inquiry-based learning along with the students' enriched learning when they receive guidance and feedback on collaborative research projects. Students who do research with a faculty member spend a fair amount of time with that faculty member; as a result, students learn firsthand how a faculty member thinks and deals with the inevitable challenges that crop up in the course of an investigation. Students who do research with faculty also are more likely to persist, gain more intellectually and personally, and choose a research-related field as a career.

[xxiii] Smith, Gregory A, and David Sobel. *Place- and Community-Based Education in Schools*. Vol. 313. Routledge, 2010.

[xxiv] Unfiltered here means not already curated and interpreted by others.

[xxv] Here it is important to place the students' research findings in context; the critical goal is to guide and motivate the students' research activity such that the research is genuine and reflective, generated by students' actual engagement, rather than a performance driven response to perceived expectations.

[xxvi] The New York Public Library's Map Warper is on useful tool for this process, where digitized historic maps are geo-rectified to allow study of the differences between historic and current conditions. See http://maps.nypl.org/warper/.

[xxvii] As many courses that require student papers do not require annotated bibliographies, the students often lack familiarity and experience of producing a rigorous compilation of properly formatted citations with summaries of the source material and how it relates to the research question and hypothesis.

[xxviii] See https://www.audacityteam.org

[xxix] Francis, K., Henderson, M., Martin, E. *et al.* Collaborative teaching and interdisciplinary learning in graduate environmental studies. *J Environ Stud Sci* **8,** 343–350 (2018) doi:10.1007/s13412-017-0467-0

[xxx] Kuh, G. D., Schneider, C. G., & Association of American Colleges and Universities (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities. p.12.

[xxxi] See Ambrose, Susan A., Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, and Marie K. Norman. *How learning works: Seven research-based principles for smart teaching*. John Wiley & Sons, 2010.

[xxxii] ibid, Table 3 p.16. In addition, it is important to note that *Learning Places'* emphasis on undergraduate research addresses the AAC&U documented lower participation rates of minority students, first time college students, transfer students, and younger students.