ABSTRACT: A popular motto for Austin is “Keep Austin Weird.” How weird are Austin’s neighborhoods? Were they historically so strange? What are prospects for the future? How can the qualities of place be captured in a geodatabase and studied? This presentation focuses on opportunities to incorporate GIS in the classroom for hands-on study of the dynamics of urban development and change. Ideas were generated while developing GIS labs and workshops to enhance planning and historic preservation courses at the University of Texas at Austin. Strategies were gleaned while coordinating student participation in a national survey of commercial vernacular buildings at UT-Austin and in dissertation research on urban change along commercial corridors. This session focuses on innovations to engage students with study of durability, adaptation, and change in urban neighborhoods through time.

Maps can give the impression of stability; often they are created to provide a snapshot in time. In contrast, real cities, such as Austin, Texas, are continually changing. Exploring and communicating a city’s characteristics, history, and patterns of transition offer important educational opportunities for students seeking to practice urban planning, preservation, architecture, urban geography, and other related disciplines. This paper summarizes ideas for incorporating real world GIS into coursework. It presents ideas for engaging students with concepts of place and change in urban areas. It represents an exploration of potential learning goals, outcomes and data sources and methods.

Sources of Inspiration for Hands-on Educational Experiences on Urban Change
The following ideas were generated in the course of adventures in teaching and research as a PhD student at the University of Texas at Austin over the course of approximately four years. This includes developing curriculum and teaching GIS labs for two graduate-level urban planning courses Introduction to Geographic Information Systems and Plans and Plan-making. It also draws upon experiences in creation of a short workshop or Preservation GIS Sandbox for graduate students taking Sustainable Preservation course and instruction of a GIS Bootcamp for students new to the Master in Community and Regional Planning program.

In addition, ideas were generated when the Preservation Green Lab, a research wing of the National Trust for Historic Preservation, invited UT-Austin and other universities around the country to
participate in a national research project. Called *Getting a 50: A Survey of Small, Older Commercial Buildings for Deep Energy Retrofits*, students and other volunteers at participating institutions were asked to gather detailed information and photographs of approximately 100 commercial buildings at each research site. While the Preservation Green Lab survey was not designed specifically to incorporate GIS, ArcGIS online was used as a tool for coordinating student surveys and as a vehicle for making municipal permit data readily accessible to students who did not have desktop GIS skills.

My dissertation research has also led to further brainstorming about means to incorporate GIS into student learning. This interdisciplinary, mixed methods research seeks to uncover the dynamics of preservation and redevelopment along older commercial corridors in Austin. It involves mapping and spatial analysis at a fine grain of details along corridors. It has included experiments in relating diverse datasets such as current and historical photographs, historical data, building permits and other kinds of data using the geodatabase file format. Like the Preservation Green Lab’s survey, it involves in-depth observation and research of existing buildings.

Finally, I gleaned ideas as project manager of a research team that created a web-based tool to support citizens and professionals in working together to survey historic places in Austin. The Wiki was developed for the City of Austin’s Historic Preservation Office. Like other citizen science and volunteered GIS websites, the Wiki supports citizens in generating geographical data that can be used in analysis and decision-support – in this case in the identification and documentation of historic resources. The data generated from this site represents another category of information that can be incorporated into classroom learning opportunities.

Although these are diverse experiences in research and teaching, they are drawn together by the realization that planning and preservation curriculum can benefit from in-depth, place-based, real world research. So much of GIS curriculum is based on canned exercises. Meanwhile, studio classes tend to focus on generating ideas for new projects, often without fully exploring the existing built environment and sometimes without the benefit of GIS. Students can gain from a fine-grained understanding of urban dynamics by exploring the attributes of cities and how they change over time. The potential for using GIS in the classroom, even outside of classes aimed at technical GIS skills, is substantial.

A necessary caveat is that this paper consists of approaches that are largely aspirational. It pulls together bits and pieces of inspiration into specific learning outcomes. It relates them based on the idea that there is value in engaging students with social processes and material change that may be visible using GIS and in the process, organically raising questions and concepts of space and place. There are no post-test assessments of the use of the particular datasets or any guarantee that strategies mentioned here will produce desired outcomes. The purpose of this paper is to inspire further exploration using available datasets related to the built environment and to brainstorm means to use it to enhance knowledge generated in the classroom. This paper ends with musings on the incorporation of technical advancements in GIS and its significance and potential to enrich collaborative faculty and student research.
GIS and the Weird Question: Local Insights for Enriching Urban Studies and Planning Curriculum

“How is Austin weird? What makes it weird? Is Austin losing or gaining its characteristics of weirdness? For whom is Austin weird?” Simplistic, yet challenging questions can be useful as a starting point for classroom conversations. Such questions would likely generate a room full of faculty rolling their eyes. They would not pass as “researchable” by the estimation of most faculty and a GIS analyst would be challenged in operationalizing them. Nevertheless, they can be an important starting place for challenging students. A conversation and perceptions of place and change can move to more specific questions and with facilitation move to questions generated by students themselves. They can iteratively learn about space, place, and change by exposure to empirical information and GIS tools.

Before sharing ideas for encouraging students to think about concepts of space, place, and change (and expose them to means of using empirical data and GIS tools), let me first back up and describe some additional background. The phrase “Keep Austin Weird” has specific connotations that often come out in local conversations. The history of this phrase is described in Joshua Long’s recent book *Keep Austin Weird: Sense of Place and Creative Resistance in Austin, Texas.* Long links an appreciation for local culture with a deep sense of place and resistance to what some feel is the homogenizing influence of globalization and modernity. Credit for the phrase “Keep Austin Weird” is given to Red Wassencich, who is purported to have said it on radio, then made bumper stickers. It was later used by the Austin Independent Business Alliance, a nonprofit that provides joint marketing and support for local independent business. It is used by AIBA in campaigns meant to encourage customers to support local businesses and the economy by purchasing goods and services locally. Colloquially, the phrase is understood in a multiplicity of ways that relate to place, economy, and change.

Why is this relevant to GIS and spatial analysis? For students of planning and historic preservation in Austin, it points to several scales of inquiry that can contribute not only to spatial literacy, but to a deeper understanding of the intertwined social and material aspects of Austin. As a place that is often cited as undergoing rapid change, “What makes Austin Weird?” can be interpreted as a question oriented toward the present and future. It can morph into deeper conversations about Austin’s unique character, how its reputation has developed, how people use the phrase, and whether it warrants incorporation into charting the future course of the city.

To students oriented toward preservation, “weird questions” can spur inquiry into existing built environment and how its historic places contribute to a sense of place. It leads to questions about Austin’s past and how it has developed into the eclectic set of neighborhoods with a mix of older building stock and new infill. It challenges students to identify the places that contribute to Austin’s sense of place and to explore the extent to which older building stock is valued and repurposed or demolished and replaced.¹

¹ As an example, UT-Austin graduate students have explored the relationship was between older building stock and Austin’s thriving live music scene. (Austin is touted as the “Live Music Capital of the World.”) Their hypothesis was that Austin’s older buildings provided a habitat for local businesses that spurred millions of dollars of economic value. Their
These conversations can move to spatial exploration. As described in the following pages, there are a growing number of local governments, such as Austin, that make rich GIS datasets available to the public. This enables student inquiry to involve incorporation of real data that relates to themes of place - and can incorporate a surprisingly detailed model of the city. These datasets can be used to understand a city’s building stock through building inventories and footprints and georeferenced aerials. It can explore change at the level of individual buildings and parcels through tax assessor’s data and geocoded building permits and site plans. Datasets can enable a look at business composition in particular areas of the city. These layers can include information on cultural resources, such as surveys of historically significant places and information from crowdsourced sites that indicate how people relate and value places. All of these layers are intricately interwoven models of the city - layers that provide an opportunity to link theory and empirical data through the analytical and communicative strengths of GIS. Even so, I have encountered few planning and preservation programs that bring them together in sustained place-based inquiry.

Students and faculty together have the potential to create new datasets or add to existing ones with their own observations and research. Datasets can be tied to service learning opportunities and related to students’ own observations of place. Through these methods, students can gain more confidence in their ability to see patterns and trends in the data and apply. These opportunities are not specific to Austin. In many cases, the local government data are readily available. Where this data is not readily available, there is potential to incorporate firsthand student data collection.

Perhaps Austin isn’t so weird. There are a myriad of other cities that have shared questions that relate to a sense of place and change. For instance, researchers at Portland State University have gone beyond “weird” asking which neighborhoods are most “badassed” and have produced a “badassness index” using spatial analysis. The list of weird-like questions for other cities could go on and on; the point is finding a means to engage students and ask them to take the next step to define their questions in more specific terms. Next is to expose them to the tools that can help them see patterns and trends and help them relate diverse sources and layers of data. It is a key proposition in this paper that geographical information systems can be an essential component and tool of place-based inquiry, whether the curriculum is for students who have little to no GIS skills or includes students with advanced skills.

**GIS-enhanced Learning Outcomes for Present and Future Professionals**

Planning and preservation are both action-oriented disciplines. A keen understanding of people and the built environment are required to operate in professions that demands analytical, creative, and political skills to accomplish concrete goals. GIS provides tools for visualizing urban change, which can give students analytical and communicative skills. The following are proposed learning goals or outcomes and suggested means to approach them via GIS.

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research did not use GIS, but would have deeply benefited from it. This research pointed to the nexus of economy and local business, real estate, economy, and historic preservation.

**Outcome: Where Local Businesses Locate and How they Shape the City**

Urban areas often have thriving areas of the city with attributes that make them fertile habitat for local businesses. Planning students can benefit from understanding the composition and distribution of businesses in neighborhoods and other districts. It is common for planning students to interact with land use and zoning maps; however, it is much less common for them to interact with detailed business data. The same could be said for preservation students, who are likely to find employment in the nation’s central business districts and main streets. Nevertheless, they would benefit from opportunities to visualize historic districts and older areas of the city in terms of their economics and business composition, rather than solely as collections of historic buildings.

Universities often subscribe to digital business databases, but students outside of schools of business may have no exposure to them. ReferenceUSA is one such source of information. Students can use ReferenceUSA’s custom geographical search function to identify businesses by zip code or through an interactive mapping function. If students have limited experience in using datasets, business data might be prepared in advance. Detailed business data includes information business name, industrial classification (NAICS code), the amount of lease paid by businesses, whether businesses are franchises, and a surprising array of other detailed business information. These can be used to understand the economic health of districts or to find clusters of related businesses.

Additional sources of information for business composition over time include city directories and Sanborn maps. City directories provide the name of residents and businesses by street address. These businesses names can referenced for particular streets and then geocoded. This can be done for a finite area for regular intervals or particular years. This data can then be used to show both continuity and change in areas over time. For preservation students, business composition adds not only to their sense of the present city, but is also vital information for research aimed at designating potential landmarks and historic districts. Hand coding would be required, but businesses can then be classified according to type and then symbolized.

Other key information can include the political boundaries that shape businesses and development within neighborhoods or districts. For instance, the City of Austin makes the boundaries of community organizations that are registered to receive information about city processes, available in the form of a shapefile. This includes the boundaries of merchants associations and Independent Business Investment Zones (IBIZ Districts.) IBIZ districts are formed through the support of the Austin Independent Business Alliance and their boundaries represent areas where local businesses have organized to create a distinct identity and meet criteria such as walkability and percentage of independent businesses.

GIS exercises for students may include symbolizing by business type or other attributes of interest and noting the composition of particular areas of the city. Students could be encouraged to compare to other layers of information, such as building footprints, tax assessor’s parcels, land use and zoning layers, building permit data, and demographic data. Students can also be encouraged to

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3 Other sources of business data include Dunn and Bradstreet and data provided through Business Analyst.
select a particular planning issue that relates to the development of the city and to look at the
distribution of businesses relative to that question. Austin-specific questions that could be
transferred or reworked for other contexts include the following:

- Austin is recognized as a city where small, independent businesses thrive. Are there pockets
  of independent businesses or are they distributed throughout the city?
- Certain areas of Austin have been noted for undergoing gentrification. What is the
  composition of businesses within neighborhoods that have this reputation? How does the
  composition of businesses in commercial nodes or districts recognized as “hot destinations”
  compare to other places that lack this reputation?
- Are there certain kinds of businesses that are more likely to locate in new versus existing
  buildings? What kinds of businesses tend to contribute to the perception of Austin as a
  “creative city”?
- How has the composition of businesses changed over time? Are there patterns in the kinds
  of businesses that should be recognized as a historical resource? Are there longstanding
  iconic businesses that are or should be community landmarks?

Figure 1. Screenshot of geoferenced road map from 1960 with locations of restaurants, hotels,
and motels in zip code 78704 as of June 2012. Despite many changes in South Austin, the map
illustrates how the commercial corridors retain their role as “restaurant rows” serving tourists.
Corridors also serve inner neighborhoods that have undergone a process of gentrification. Note
the bottom left of the graphic shows the edge of the geoferenced 1960 Humble Oil inset map.
Outcome: To understand multiple scales of development activity, from the individual building to neighborhood and city-scale patterns. Planners work in both the review of individual properties and in long range planning that is intended to articulate and find means to reaching goals for the city. One area of planning is oriented toward implementation of development ordinances and shaping development occurring in the present (current planning); the other is intended to shape future development and city policies (long range planning). These different temporal and spatial scales - the individual development under review, the development in the context of neighborhoods or districts in the present and future, and citywide trends and predictions are important for planners to acknowledge and navigate. GIS can help students to explore multiple scales and assist them to develop a more nuanced understanding of urban change.

In Austin, the potential use of building permits as an educational tool is facilitated by the availability of geocoded building permit data and an on-line permitting information system called AMANDA that is also available online to the public. Recommended activities revolve around use of building permit data for examining real world cases and trends. Working with building permits might be perceived as a dry, boring activity; on the contrary, permit data can be quite engaging. It reveals areas undergoing rehabilitation or where new construction is occurring. One can see the distribution of demolitions and the relocations of older houses to new sites. These are patterns that can help students later in their professions to gain insights into the urban fabric as a system and see neighborhoods in terms of cycles and trends.

Working with permit data can take a considerable amount of time and preparation, even if it is readily accessible in geocoded format. In Austin, the data schema of building data has changed over the years. Early datasets from the late 1990s have minimal information about permit cases, while recent years have detailed explanations within text-based columns. Differences from year to year, mean that faculty and teaching assistants either need to spend time merging datasets from multiple years or work with a small number of years. Even one or two years of data can give students a taste of how one would work with permit data.

For students with little to no experience with GIS, permits can be imported into a web map or application on ArcGIS online. Alternatively, students who have more time, can be provided basic instructions for symbolizing permits based on type (e.g. in Austin they can be geocoded by (demolition, new construction, commercial remodel, etc.) Advanced students can be given more intensive opportunities; for instance the map below show results of a pilot geographically weighted regression run on demolition data.

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4 While Austin may be unique in the breadth of the information it provides, it is anticipated that more municipalities will be able to provide this kind of geospatial data in the future.

5 Students exposed to data and GIS may later move into spatial statistics and predictive modeling in advanced classes or in their professional career, which will benefit research in both planning and preservation. Local statistical methods of analyzing building permits and other municipal data are likely to be promising areas for research. Local statistical methods provide an analyst with the ability to see results where neighborhoods or other units of the city can vary. This can provide valuable insights into the city that cannot be obtained from running global tests that generalize estimates or models for an entire urban area. These kinds of advanced
Students can move from exploring the distribution of development activity at a bird's eye view to a finer grain analysis of the individual development site or building permit. Building permits for individual properties represent individual vignettes of development activity - stories of change that involve real people and places. These development activities often involve stories of negotiated change -- between planners, neighborhood associations, property owners, tenants, etc. -- negotiations that are valuable for students to understand.

For case study developments, faculty should select a finite number of permit cases that are somehow controversial, spurred neighborhood action, or that are particularly representative of an interesting kind of change. For planning students, this might be controversial or successful examples of land use changes, mixed use development, an addition or major rehabilitation that involved review and dialog by multiple actors. This information might be obtained through making contacts in a pilot neighborhood or commercial district. It could also be gleaned through conversations with a local planner.

Students could then be required to interview at least two people who applied for, reviewed, or commented on a development application. Students can produce a reflection paper and a large-scale map showing the property, detailing the facts in the cases, and reflecting on what they can learn from this instance of development activity.

In addition to building permits, other sources of data can be used to scaffold student research opportunities. Georeferenced digital Sanborn maps can be made available for detailed comparison with current base maps, land use maps, and building footprint feature classes. Polygons depicting prior subdivisions are readily available in Austin. Other preservation-related data include historic landmark data and historic district overlays. These provide additional means of illustrating how students can look for patterns. With historic maps, they can look for persistence and change. Within landmarks data, they can explore the spatial distribution of landmarks to identify areas lacking in active preservation efforts as well as examples of areas where landmarks may have a positive effect on trends in rehabilitation and reinvestment.

The analysis and display of census data is typically incorporated into graduate-level GIS-based planning courses. However, mapping of demographic change is seldom paired with mapping of detailed datasets showing development activity. Courses can combine mapping of demographic change with information on development activity, such as building permit data. This could offer substantial opportunities for students to visualize socioeconomic shifts that precede development activity or social trends that follow processes of reinvestment or disinvestment. Students may come to understand the built environment as a socioeconomic system, rather than simply a snapshot in time - whether that snapshot is present or future - it remains static until students begin to understand the urban fabric as a dynamic system.

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GIS methods are best suited for students who have some experience with statistical methods and are well suited for independent study.
**Outcome: Understanding the Breadth of Opportunities for Data Collection and Volunteered Geographical Information**

With enhancements to GIS file formats and online services, there are more opportunities for students to collect and organize information captured through their own observations and data collection from the public. Just as expertise in planning requires planners to be able to address multiple scales of development, planners must as be able to collect, organize and synthesize data from their own direct observations of the built environment. They would also benefit from knowing how to use volunteered geographic information or citizen-generated sources of spatial data.

The survey of commercial buildings through the Preservation Green Lab was a good example of a student activity that could be used to engage students in both data collection and analysis activities. As mentioned above, ArcGIS on-line was used to make building permit data in shapefile format available to students who lacked GIS skills. In addition to accessing prior permit data, students visited assigned buildings, gathering firsthand observations about building attributes, and took photos. They also attempted to contact owners and managers to gather data on HVAC systems.

![Figure 2. Screenshot of map showing data and associated photographs attached to a building footprint. A student for the Preservation Green Lab survey collected this data.](image)

The students participating in the Preservation Green Lab survey were generating volunteered geographical information. In this respect, it was like other citizen science projects where citizens participate in collection of scientific data collection, e.g. collection of bird sightings for ornithology or invasive species sightings for environmental science projects. Because the data accepted were tightly controlled in the data collection process, there was little ability for students to provide data
about how they perceived buildings or what they thought about them or provide information beyond certain protocols.

In the survey process, I concluded that some students yeared for more control over the data that they were collecting for the Preservation Green Lab. There were concerns that some of the data may not prove to be useful and lacked data about the cultural value of buildings - information that was often at the heart of student interest in the built environment. Some students expressed the desire to better understand and even shape the way data was collected -- to make it more relevant to their own questions about preservation and sustainability.

Through the experience, it became clear that there is great potential for students to gain experience from gathering firsthand observations of the built environment. A lesson learned was that the process of data collection is time-consuming. As their entire effort was aimed at collecting observations, they had little opportunity to experiment with the data themselves. Having students brainstorm and conduct a pilot survey of the built environment that is less intensive and directed toward their own questions could lead to more student satisfaction and learning. It is likely that both preservation and planning students will need to be able to make observations and design ways to record and share those observations in a meaningful way during their careers. Therefore, in classroom data collection can be a promising activity, but would require a substantial amount of time in setting the stage for this kind of work.

Although the Preservation Green Lab data was not aimed at generating data in a spatial format, it illustrated an opportunity for the use of a geodatabase to produce a sharable format that can accommodate multiple types of data - from free form text to controlled vocabulary, to quantitative data, to the collection of rich multiple media. Geodatabases provide a resource for students and faculty to organize mixed data types and to share it with other researchers, colleagues, or the public. Planning students are increasingly expected to graduate with some GIS skills and it may be particularly valuable to expose them to use of geodatabases and enabling attachments such as photos and documents to features for their own work.

ArcGIS Online also provides a means for students to practice direct data collection and mapping. This platform requires less time for orientation than ArcGIS Desktop. Student generated photos can be uploaded to Flickr and then shared via a URL. An added advantage to ArcGIS Online is the ability to create and co-edit collaborative groups. This makes this platform a viable option for teamwork.

Creating tools to collect volunteered geographic information is likely to be well beyond the scope and time limits of a single class. In its stead, there may be opportunities for students to work with volunteered geographic information from existing sites. The Austin Historical Survey Wiki is one such site, where citizens can survey historic places. Anyone is able to contribute information and students have the opportunity to use the platform to volunteer data themselves. In this case, students can gain experience working with citizen-generated data by downloading Wiki data in a .csv format and then display the data with XY coordinates in ArcGIS Desktop.
Making observations and working with citizens to collect both empirical and values-based data are important skills for professionals. Citizens may be given leeway to provide information about what they value, like, or dislike about a place or they might be engaged in the collection of scientific or specialized data. In either case, work with volunteered geographical information systems can help students begin to think about means of positively shaping and preserving cities with real data and citizen participation in mind.

**Technical Capabilities for Teaching and Research**

There were several technical aspects of ArcGIS online and ArcGIS Desktop 10.0 that were proven useful in the research process. They are also hypothesized to work well as teaching aids.

ArcGIS Online services had been launched just before the Preservation Green Lab Survey was distributed within the Sustainable Preservation Seminar. I experimented with using ArcGIS On-line as an organizational tool, providing the class with on-line maps for their blocks to survey. I also used it as a platform to provide building permit information available for study areas. Because the study areas were relatively small, permits could be provided in separate shapefiles per year, so the upper limit on the number of features per layer was not reached. Since there was general familiarity with on-line maps, graduate students were able to access the on-line information with relative ease. However, they did require coaching on how to read specialized codes in the datasets and how to find more information through the AMANDA building permit information system, which was a separate on-line resource that does not incorporate GIS.

In addition to its use in organizing students and providing them with geospatial data, ArcGIS Online could have been used in collaborative mapping, where students are able to contribute to a single map. This approach was not initiated, since the Preservation Green Lab had a separate web tool that they required students to use for data collection purposes. For faculty with more flexibility in how they collect and record data, ArcGIS Online might provide a good platform for students to use. As ArcGIS Online is relatively easy to use, it could provide students with little prior exposure to Desktop GIS with opportunities for geographical literacy, building their data collection and analysis, and communication skills.

Another substantial opportunity is the use of the personal or file geodatabase format for faculty and student research. As mentioned previously, the geodatabase format allows for the storage of associated photographs and documents that can be keyed to individual features. After the Sustainable Preservation course was over, student work was incorporated into a geodatabase for use in dissertation research. The sophisticated file format allowed for associated photos and documents to be stored with other kinds of data and metadata for each surveyor. The geodatabase can then be shared with other faculty, students, and researchers. It can also be continually enriched and layered with other data sources.

The geodatabase created for building information took a substantial amount of editing time. Therefore, it is recommended that faculty budget time to prepare a geodatabase. A teaching or research assistant who is fluent in the use of GIS could ease the amount of faculty time required in
compiling data, photos, and documents. Direct student participation in creation of a geodatabase to be used for future research would best be accomplished with students who have skills in GIS and can work under the direct supervision of faculty who are knowledgeable in GIS. Therefore, the geodatabase is a valuable research tool that can be used in compiling spatial data and observations from students, but the data preparation would likely be best done by a limited number of students rather than an entire class.

Other new features in ArcGIS 10, including time-enabled mapping. With relative ease, students could experiment with showing change over time. This is particularly useful in showing change year-by-year with permit, land use, and business data. Students can easily create movie files that show the distribution of demolitions, new construction or remodels.

**Additional Recommendations and Conclusions**

Real data can benefit student learning; however, in order for this to work, faculty must set the stage for this research. They will need to spend time preparing data and drafting detailed instructions for students, particularly if working with students new GIS. If the course is intended to focus on the content of understanding cities, rather than building GIS skills, faculty should consider using ArcGIS online or having students develop basic GIS skills such as display and making simple symbolization queries. Faculty can assemble shapefiles or a geodatabase ahead of time, which can cut down on logistical issues, but it is recommended that students be provided detailed instructions on how to download and import data for future reference. Faculty should give students opportunities not only to participate in data collection, manipulation and analysis, but should consider means of shaping hands-on classroom research project where possible.

Throughout the process students should also be encouraged to ask questions. They should begin to realize that expertise in GIS would take longer than a single course. Exercises may whet their appetite; however, they should understand that they are dipping their toes in a much wider area of potential research. They should be provided with life jackets!

The ability to use and apply geographical information systems is increasingly considered a core skill in a planning education. Within the context of a graduate education in preservation, GIS is less recognized as a requirement for professional practice. This paper points to opportunities for including GIS in classroom-based activities for place-based inquiry. Beyond that, it is an opportunity to brainstorm means for planning and preservation students to find a passion for asking questions about cities and experimenting with analytical and visual means of pursuing their respective professions.

The methods and data sources summarized above are shared with the intention of helping students learn how to make empirical observations about the built environment and then make informed decisions about how to represent them. Building permits, business data, digitized historic maps, and the data created by students themselves or citizens, provide a myriad of sources and activities for engaging students in real world problems and questions. Governmental, nongovernmental and
private sector sources offer a variety of available data on the built environment that can be thoughtfully used for classroom inquiry. Furthermore, work with volunteered geographical data can help students to gain experience with integrating citizen participation in their future work.

Sources


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