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This is the final peer-reviewed author's accepted manuscript (postprint) of the following publication:

Published Version:

Zaneri Taylor, Smurra Rosa (2023). Public Health, Artisanal Activities, Daily Life in Medieval Bologna: Digital Projects as Teaching Tools for Urban History. Cham : Springer [10.1007/978-3-031-38871-2_15].

Availability:

This version is available at: <https://hdl.handle.net/11585/937434> since: 2023-08-01

Published:

DOI: http://doi.org/10.1007/978-3-031-38871-2_15

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Public health, artisanal activities, daily life in medieval Bologna: digital projects as teaching tools

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Abstract. This paper will examine how the material from two digital projects, the 1296-7 Estimi online library and the Healthscaping Medieval Bologna webgis, can be used as teaching materials for urban history students. These projects provide students with an interactive means to access primary source material and present a vivid and nuanced picture of how the medieval city of Bologna balanced its vibrant artisanal population and its economic activities, with sanitary and hygiene needs. Instructors can incorporate the material from these two projects into lectures on medieval urban history and pre-modern public health and can also use them to teach specific skills including 1) medieval Latin and paleography, 2) data collection and analysis, and 3) GIS visualization. The data from these two projects is in an accessible form for instructors and this material can be adapted to suit the needs of students. In short, by integrating the data from these two projects, it is possible to present students with a rich case study and at the same time gives them the opportunity to explore the sources themselves, and further their own interests and skills.

Keywords: Medieval Bologna, Urban History, GIS, Public Health, Digital libraries

1 Introduction

The intersection of urban history and digital humanities has resulted in a remarkable reconceptualization of how historical research is conducted and also how these results are presented to an academic audience. From webgis to 3-D modeling to digital archives the last ten years have transformed the field, and it is almost impossible to conceive of a research project without some kind of digital component or output [1]. However the majority of digital outputs have been primarily for a scholarly audience, with much less attention given to how these research products can be used as teaching tools in classrooms [2]. This paper speaks directly to this issue and explores how two different digital history projects which focus on medieval Bologna can be used, not only as repositories of data and sources for future research, but can serve as valuable teaching tools that provide students with an interactive means to access primary source material that would otherwise be beyond their reach.

This paper will examine how these digital projects can be integrated to teach medieval urban history as well as data analysis skills. It will discuss two projects which are large scale repositories for data: the 1296-7 Estimi of Bologna, which has been digitized by the *Centro Gina Fasoli per la storia delle città*, at the University of Bologna [3] and the Healthscaping Medieval Bologna webgis hosted by the University of Amsterdam [4]. In addition to containing large amounts of primary source materials, these two projects are extremely powerful tools for teaching students about daily life, artisanal activities, and public health in medieval Bologna. In addition, they can also be used to teach students data collection, processing, and GIS visualization, along with medieval Latin and paleography. Each project offers different educational possibilities and skills that students can learn, and the data from both websites can be integrated to provide a more holistic perspective on medieval Bologna, and in particular the hygiene risks faced by its citizens.

Contrary to popular thought, medieval governments were highly concerned with maintaining healthy and safe cities, and heavily regulated the urban environment and their large populations of artisans, whose activities were a vital economic part of the city but also produced large amounts of waste that needed to be disposed of and managed [5]. The conditions of medieval Bologna, the enforcement of hygiene and sanitary regulations, and the material consequences of these actions can only be understood by working directly with primary source data [6].

2 Digital History as Medieval History: Overview of Sources

2.1 The Estimi 1296-7 of Bologna

To briefly summarize the digital sources, the first project contains the 1296-7 Estimi of Bologna which is freely accessible on the website of the Centro Gina Fasoli. These estimi are comprised of fiscal sources (tax returns) and contain over 10,000 documents, which recorded the head of each household by the church parish in which they resided, as well as other characteristics such as occupation and financial information [7]. In particular, tax returns were related to chattels and property that Bolognese citizens (both men and women) were required to submit to the city authorities for the purposes of direct taxation [8]. Based on the assessment figure derived from the total value of chattels and property listed in the tax returns, and validated or adjusted by the tax inspectors, the city government determined the *collecta*, a tax with a varying percentage rate depending on the needs of the public finances, especially when the expenses of war were to be met.

The Estimi offer valuable insight into medieval demography and the population distribution in medieval Bologna; to some extent they are relevant to the topographical study of the productive and commercial activities. By provision, heads of household had to specify the quarter and church parish (*cappella*) not just of the current residence but also of the previous one; the self-declarations were therefore collected and sorted according to these criteria (quarter and *cappella*) [9]. The Estimi also enable us to identify the social composition of city neighborhoods which is crucial for reconstructing population pressure in a certain district as well as pollution. The core of the Estimi

website is a search and browse engine for which metadata describing the tax records of 13th-century citizens of Bologna has been created. The metadata includes textual information (biographical data, professional activity, asset data, etc.) and accompanies the thousands of high-resolution digitized parchment documents.

Since the entire source is online, students can work with the raw material and learn how to read and understand the source. As such it is possible to use the Estimi to teach students medieval Latin and paleography. For example, instructors can choose several of the digitized documents and have students practice doing transcriptions, so they can learn to read medieval texts and understand what kind of information they contain. Figure 1 shows an example of an estimo of one of the parchment makers who lived in San Biagio, along with an accompanying transcription.

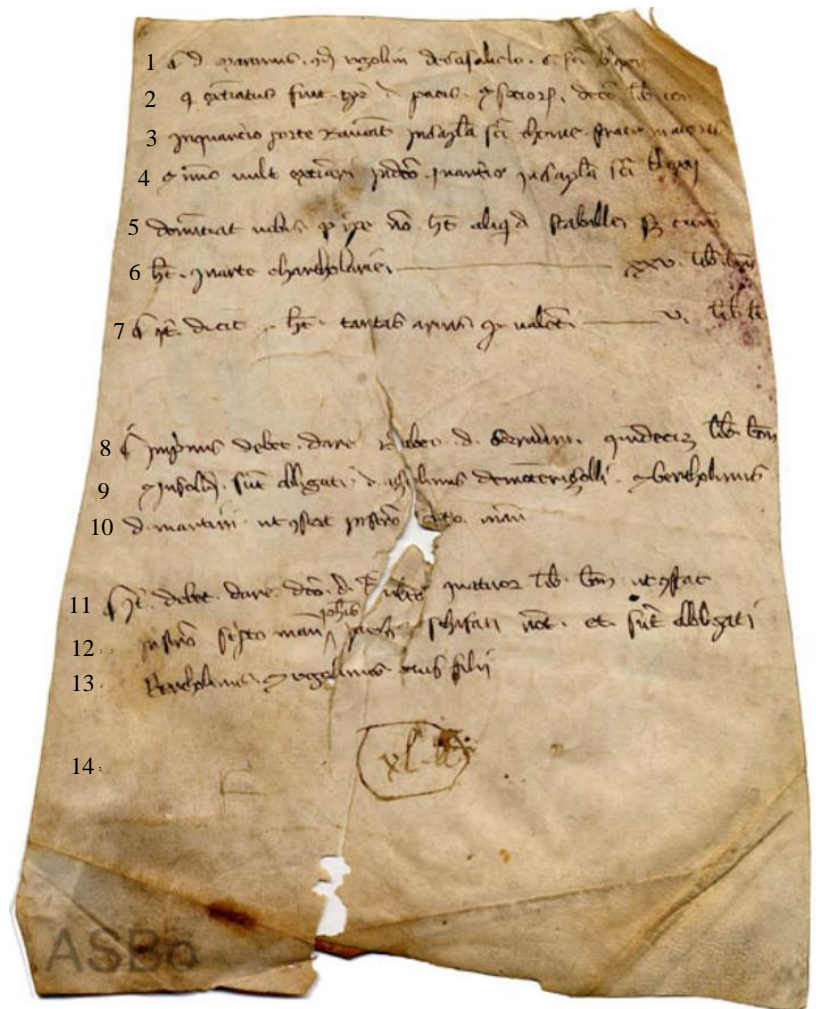


Figure 2. IT ASBo, Comune, Ufficio dei riformatori degli estimi, s. II, b. 24, 1296-97, Porta Ravennate S. Biagio, 163

- 1 Dominus Martinus quondam Ugolini de Casaliclo, capella Sancti Blasii
- 2 qui extimatus fuit tempore domini Pacis et sociorum decem libr. Bon.
- 3 in quarterio Porte Ravenatis in capella Santi Thome Strate Maioris
- 4 et nunc vult extimari in predicto quarterio in capella Sancti Blaxii.
- 5 Denuntiat vobis quod ipse non habet aliquod stabille sed tunc
- 6 habet in arte chartholarie _____XXV lib. bon
- 7 item dicit quod habet tantas arnias que valent_____V lib. bon.
- 8 In primis debet dare Rubeo domini Corradini quindecim lib. bon.
- 9 et in solido sunt obligati dominus Ugolinus de Monteruocolli et Bertholinus
- 10 domini Martini ut constat in strumento scripto manu
- 11 Item debet dare dicto domino Rubeo quattuor lib. bon. ut constat
- 12 in strumento scripto manu Iohannis Petri Schafari notarii et sunt obligati
- 13 Bertholinus et Ugolinus eius filii.
- 14 [adjusted by the tax inspectors] XL lib. bon.

All the Estimi record the church parish in which the head of household lived, but these documents could include more specific locational information such as the street or neighborhood in which the person resided, along with the names of their neighbors. And this information can be used to visualize and reconstruct medieval neighborhoods, as will be seen below. Moreover, as mentioned above, the Estimi also include the individual's financial information such as their debts, credits, as well as the total amount of cash and assets they possessed, and also at times their profession [10].

Learning to read and interpret medieval documents is a fundamental skill for history students and with this project they have the entire source to work with. In a large class, it would be possible to have students work on different Estimi from one or more parishes and then aggregate the data to conduct analyses. For students who do not have paleography skills, the Estimo website offers a searchable database in which the user can search by name, profession or key word. With each search a short summary of every document is returned; in addition it is also possible to browse all the documents, which are organized by church parish. Therefore even students who do not have paleography training can read the short summaries, and these can be used to teach students about the financial realities of the citizens of Bologna, along with the distribution of the population across the city.

2.2 Healthscaping Medieval Bologna

The second source is a webgis, titled Healthscaping Medieval Bologna, which was created as part of the ERC project Healthscaping Urban Europe, directed by Prof. Guy Geltner. This site integrates historical and archaeological information relating to public health, hygiene and infrastructure for Bologna from the 13th and 14th centuries [11]. In particular this webgis provides insight into how officials regulated the artisanal population and managed their infrastructure and environment to promote urban health. The Healthscaping website includes the data in processed form, meaning that it does not have the primary sources available, although some are freely available online. Instead it maps several different sources including: 1) the registers of city officials who were

responsible for enforcing hygiene and infrastructure laws – this office was known as the *Ufficio delle acque, strade, ponti, calanchi, selciate e fango* (this is abbreviated in this paper as *Ufficio del fango*), 2) the 1245-67 statutes, which contain the hygiene and infrastructure regulations, and 3) published archaeological evidence of artisanal activities, waste disposal, and infrastructure.

To briefly describe each, the *Ufficio del fango* dataset (which was compiled by Prof. Geltner), is the registers of medieval officials who documented health and sanitary violations that occurred in medieval Bologna. Comprised of 3,500 records from 1287 to 1383, officials described these violations in registers and noted valuable information such as the church parish in which the problem occurred, along with the occupation and gender of the person(s) they deemed responsible; such offenses included a butcher disposing of animal remains in the street or a non-functioning sewer in a neighborhood [12].

The webgis has an interactive interface which allows the user to query the *Ufficio del fango* dataset by demographic characteristics (gender, occupation, church parish), or by type of offense or materials (dung, animals, dirty water) or infrastructure involved (road, canal, well). Instructors can conduct their own queries for specific teaching purposes or students can be allowed to explore the webgis freely. Some queries that can be useful for teaching and discussion could include, which types of artisans were most cited for health violations and where did they live? Or where were women most likely to be cited for health violations?

In addition, the Healthscaping website also includes health regulations from the 1245-67 statutes of Bologna, which have been localized by street, and can also be queried by type of regulation, materials and infrastructure described [13]. Finally the website also includes archaeological evidence of waste disposal, infrastructure and artisanal activities [14]. Therefore it is possible to compare the health regulations, their enforcement by the *Ufficio del fango*, as well as material realities of daily life in Bologna. In sum this website provides students with the ability to work with multiple different sources and to think about the types of information available in each. From an educational perspective, it would be possible to design a lesson based on a specific artisanal activity or type of infrastructure and query each source to see what kind of data it offers. Presenting data in this medium allows students to conduct analyses based on their own interests and encourages them to reflect on the kinds of questions that can be asked of these sources.

Both of these projects can be used as teaching tools in their own right, or they can be combined together, since each offers different types of information and insights into medieval Bologna, its population, their activities, and the kinds of health problems and risks they faced. In order to do this, students first need to have some grounding in GIS methodology and how to conduct digital history research.

3 Teaching GIS Methodology as Digital History

Now that we have reviewed the sources, this next section will give an overview of how to work with these two projects to teach data visualization and analysis in GIS. In

particular this section will review how to translate historical sources into spatially mappable data. And within this broad theme there are four skills which are critical 1) research design, 2) spatial representation, 3) data organization, and 4) data visualization and analysis. Introducing students to methodology is crucial but this can and should be adapted based on the confines of the course, the familiarity of students with GIS and their experience working with historical sources. It is possible to provide a brief overview of these skills in one or two lessons in a general urban history course, or an entire course can be designed focusing on digital history methods. In either case, it is important that students walk away from this experience having a clear understanding of the types of choices that are made when designing a research project and collecting data, and for them to understand how these choices influence outcomes.

Our recommendation is to give students translated material in order to teach these four concepts. This allows them to get direct experience working with the sources and provides them with a foundation for understanding what information is contained in sources and the kinds of research questions that can be asked. Beginning with research design, students can be given some of the Estimi which have been transcribed or some of the published statutes from 1245-67, and be tasked to come up with possible research questions.

The following excerpt is an example of one of the statute regulations which can be used for this activity:

“It is not permitted for anyone to beat skins from the house of the brothers of Lamberti up to the houses of the sons of Beccadelli in strata Santo Stefano, under the penalty of 100 soldi, as to not disturb the religious practices and to avoid polluting the water of the well [15].”

It can be useful to have students analyze multiple statute excerpts and to discuss how to translate this information into spatial data. At this point, it is crucial to introduce some basic GIS concepts. And the most fundamental concept here is establishing the spatial unit – in other words, how information will be represented and analyzed in a GIS environment. And this is going to depend on 1) the research question and 2) the spatial information contained in a source.

To teach a digital history course, ideally students should have at least one lecture introducing GIS data formats – vector and raster – vector is for discrete data types, with fixed boundaries (for example a house or a road), and raster is for continuous data such as elevation or land cover. Typically with historical data, vectors are the most suitable and vectors allow for three geometric representations, points, lines and polygons [16]. It is critical that students understand how their data will be represented before they can do any work or analysis in GIS. It is also critical that instructors stress that the spatial unit must be clear and consistent throughout the historical source in order to work with it in GIS.

For these two projects, 1296-7 Estimi and the data from the *Ufficio del fango* from the Healthscaping webgis were recorded by parish [17]. Therefore they have the same spatial unit. We do not know the confines or territories of parishes, but we do know where the individual churches themselves were, and we can represent these as points. In addition, the Healthscaping webgis also includes some data from the 1245-67

statutes, which can be mapped and identified by street – as such this data was represented as lines [18].

Once students understand what data sources offer, and how it will be represented in GIS, they also must consider how it will be organized. Again we recommend having students work with some of the source material, and based on their research questions or goals, ask them what data they would collect and how they would organize it in a spreadsheet.

It is useful to do this exercise in small groups and then have students come together and discuss with their peers the different approaches they might take. After students understand how to organize data collected from sources and what kinds of information can be obtained, the next step is to teach them how to input this data and visualize it in GIS, and conduct simple queries. Both the Estimi and the Healthscaping project can be used to teach students how to display and analyze data. And the two sources can be combined to provide students with a richer experience with data analysis, as well as provide a deeper understanding of hygiene and public health in the medieval city.

4 Case Study of an Urban Neighborhood: Putting it all Together

To demonstrate how these projects can be used to teach students about public health, artisanal activities, and daily life in medieval Bologna, along with GIS and data analysis methods, this section presents a case study of one neighborhood of Bologna. We will explore an area called *braina Sancti Stephani* (see Figure 2 circled area) that comprised the area of the churches of Santo Stefano and San Tommaso della Braina (also known as San Tommaso di Strada Maggiore), as well as the nearby church of San Biagio [19]. This area was home to a significant number of parchment makers in the late 13th to early 14th centuries. These artisans were in high demand in a university city such as Bologna where thousands of students stimulated a mass market for textbooks, which were made of parchment. Parchment makers concentrated in *braina Sancti Stephani* because of the abundance of water in this zone, which was particularly clean and suitable for the process of parchment making. However, parchment makers also needed to use chemicals to process animal skins as part of their work, which created toxic waste and therefore pollution risks.

To briefly explain, parchment making was a complex process that required several stages to treat the animal skins, because the skin is made up of several layers and the one used for parchment is the innermost layer. First skins had to be removed from the animals, at which point they had to be preserved in salt or they would decay. The next stage was soaking the skin in a solution of slaked lime (calcium hydroxide) for eight to ten days [20]. From there what remained of the flesh, hair and epidermis was removed manually with a scraper. Then the skin was again soaked in a vat of lime for cleansing. Finally it was stretched and washed and left to dry.

The residences of parchment makers were concentrated in two parishes – San Tommaso della Braina and San Biagio – these two churches were located very close to one another. There are two sources that we can use to identify where parchment makers

lived, the first source is the 1296-7 Estimi (recall that these were recorded by heads of households). However, the heads of household did not always list their profession, and we only have twenty who identified themselves as parchment makers; but of those twenty, thirteen lived in San Tommaso and one in San Biagio (See Figure 3).



Figure 2. Topography and layout of medieval Bologna, *Braina Sancti Stephani* circled in black
 © 2021: Digital Bologna map by R. Smurra from F. Lugli, Cartografia, in *Atlante storico di Bologna* 1995-1998 (ed. F. Bocchi)

But we know from other sources that the population of parchment makers was much larger than that. Another medieval source, the *Liber matricularum societatum artium* from 1294, contains guild matriculation lists – each profession (including parchment makers) kept membership lists which were submitted to government authorities and recorded the names and parish of their member. This source was studied and tabulated by historian Antonio Ivan Pini. According to his study, all of the 152 parchment makers in the guild membership list lived in the parish of San Biagio [21].

Therefore between the two sources we can be confident that a number of parchment makers lived in *braina Sancti Stephani*. This raises another important point for conducting and teaching medieval history – that is – the importance of comparing sources and understanding what kinds of information can be obtained from each source. In this case the 1294 source provides more complete information about the artisans, while the Estimi contain more information about the population and their circumstances.

But we can do better than this, the Estimi are wonderful because they sometimes also contain the street in which the head of household lived, along with the neighbors in houses that were adjacent. Therefore it is possible to visualize where some of these people lived. And in this case, we can reconstruct where some of the parchment makers lived by combining information from the Estimi and the 1294 list (See Figure 3). As Figure 3 shows, the parchment makers were concentrated around the churches of San Tommaso and San Biagio.

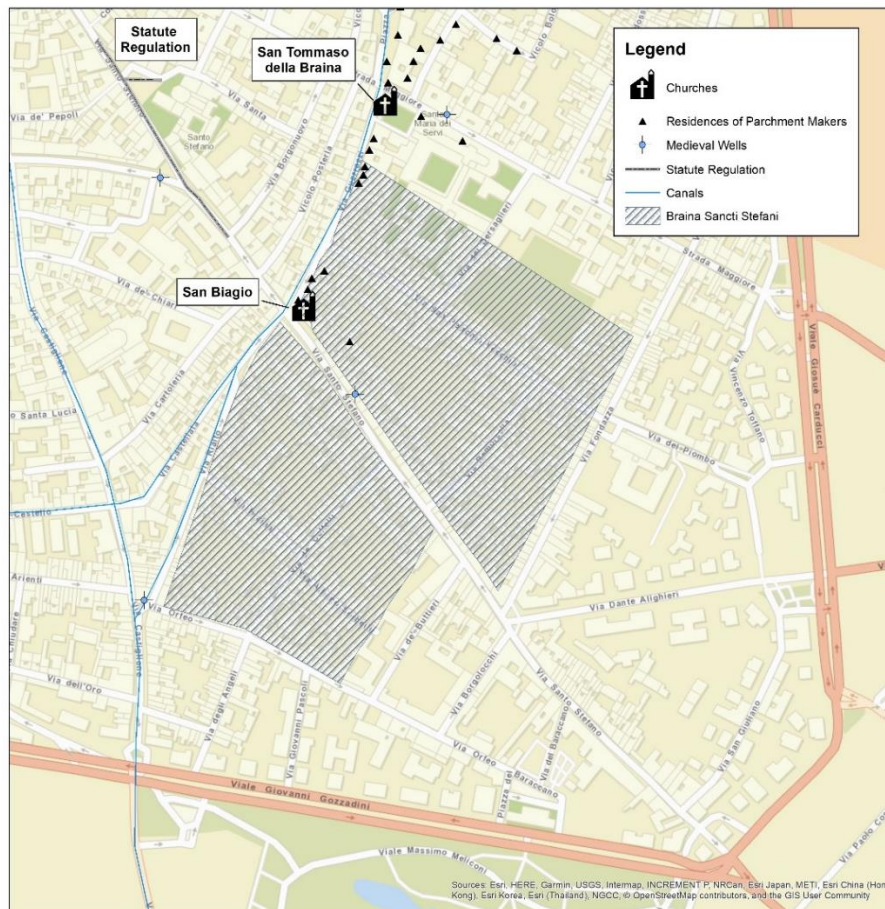


Figure 3. *Braina Sancti Stephani* neighborhood with residences of parchment makers

The activities of artisans, like parchment makers (along with others such as butchers, cloth dyers, and blacksmiths) were heavily regulated by the medieval government of Bologna, and this was especially true for activities that involved chemicals or burning since these presented immediate health risks to the surrounding population. And we have several lines of evidence that attest to this. The first comes from the 1245-67 statutes, which contain several rubrics aimed at regulating activities involving animal skins

or chemicals involved in parchment making. For example, there were prohibitions on the disposal of water that was mixed with lime (recall that lime was used for processing skins), as well as restrictions on where skins could be beaten and processed [22]. In particular, water and animal remains could not be disposed of in public streets, especially in the city center, and it was also prohibited to dispose of these near wells [23].

Sometimes the statutes offer very detailed spatial information in these regulations. For example, the statute excerpt in the previous Section 2.2 states that it was forbidden to beat skins in the area from “the house of the Lamberti brothers to the house of the sons of Beccadelli in *strata sancti Stephani*.” In this short sentence, there are several spatial markers and also a street name [24]. We are fortunate that the street names have not changed and *strata sancti Stephani* refers to via Santo Stefano, therefore we can be confident of the road [25]. In addition, it is possible to search both of these family names in the Estimi database and cross reference this information with other historical studies. Often times the statutes used the houses of important families to designate areas, and these have been well studied, making it possible to identify locations at the street level. And this is another useful lesson for students, how to identify areas discussed in medieval sources. In this case we can identify the area that the above statute regulation was referring to with these methods – the regulation applies to a section of via Santo Stefano, not far from the neighborhood, *braina Sancti Stephani* where all of the parchment makers lived (See Figure 3 for exact regulation location) [26].

In addition to the statutes, the data from the *Ufficio del fango*, the health officials, also provides some insight into hygiene issues caused by the production of parchment. For example, the fango officials cited five parchment makers who were living in San Biagio, for health violations on March 10th 1335 [27]. According to the registers the parchment makers were cited for skinning their hides under porticos, so presumably they were doing this in a private space but nevertheless it was a public problem, which is why they were cited. In addition in January of 1361, another individual living in the parish of San Biagio was cited for a swollen/rotting cow carcass in front of their house – the profession of this person is not recorded; however it is certainly possible that this could have been a parchment maker as well [28].

5 Conclusions

This paper has detailed how these two digital projects, the 1296-7 Estimi online library and the Healthscaping Medieval Bologna webgis can be used to teach a variety of concepts to students, that range from specialized skills such as medieval Latin and paleography, to topical studies of medieval urban history and pre-modern public health, along with data collection, GIS analysis and visualization. Together these two projects offer accessible materials to both instructors and students, and can be incorporated into existing lectures, or alternatively can be the basis for a stand-alone course.

One of the key advantages of the two projects presented here is that they can be adapted as teaching materials to fit the needs of several different types of courses and can be tailored to the abilities and skills of students. We have presented several different ways in which these projects can serve as teaching tools and these digital resources

offer several advantages as devices for learning: first, they offer students the ability to work directly with primary source data. In addition, students can conduct queries and explore their own interests through an interactive medium which is easy and familiar. Moreover, students can explore multiple different sources and types of data. Offering students the ability to work directly with primary source data in an accessible format is a huge advantage in that this type of dataset takes years to compile and requires expertise in several languages along with medieval paleography. And it also removes the enormous barrier of processing and analyzing the material and presents students with data that is ready to work with.

In sum, these projects offer students the opportunity to interact directly with a wealth of information about everyday life in Bologna including where people lived, their economic condition, the kinds of activities they were involved in, how this impacted the hygiene and infrastructure conditions, and how this varied across the medieval city. As such the 1296-7 Estimi and the Healthscaping Medieval Bologna webgis offer immense opportunities in the educational realm and are invaluable as teaching sources both for medieval urban history as well as for a range of methodological and GIS skills.

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