

MENTAL MAPS OF LISBON METROPOLIS (PORTUGAL) AS A TEACHING STRATEGY IN URBAN GEOGRAPHY

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ABSTRACT

Two weeks before the university lockdown, a group of twenty-three students from the Institute of Geography and Spatial Planning (IGOT) were invited to draw their image of the city of Lisbon and environs. The objective of the exercise was to compare their initial vision of the Metropolitan Area of Lisbon (AML) with the subsequent research conducted in situ, aimed at the investigation of urban planning and sustainability issues that needed intervention and change. As the university went online the 10th of March 2020, fieldwork became an impossibility. In alternative, the class was asked to identify the three main street grids, existent within the AML: (i) rectangular; (ii) irregular; and (iii) radio-concentric. To complement their assignment on the issue of urban morphology, the research further included the examination of three main square designs: (i) monumental; (ii) traffic squares; and (iii) gathering or reunion. Mental maps of cities were first used to evaluate the image of urban environments by their residents, in the work of Kevin Lynch, published in the 1960s. In this contribution, the mental maps of Lisbon drawn by the students were accompanied by an enquiry sheet with several personal data, as well as their plans for the future. In spite of the confinement, it was possible to overcome some movement limitations as, using Google Earth and Street View tools, the class examined in detail the urban morphology of the AML. In contrast, the impossibility to stroll along the streets, to interview city residents, service providers and traders, prevented the students from acquiring the necessary skills to propose urban renewal. Conclusion was that online work makes reproductive research plausible but innovation research is highly unlikely achieved. The usage of mental maps as a teaching strategy is, however, a good option, both in online and in-person Urban Geography classes.

Keywords: urban planning, urban morphology, mental maps, pandemic.

1 INTRODUCTION

Geographical enquiry about spatial information was first researched in 1913, by Charles Trowbridge that published the paper “On Fundamental methods of orientation and imaginary maps” in *Science* [1]. During the 1960s and 1970s, the issue was widely developed in English speaking countries, by such authors as Downs and Stea [2], Gould and White [3], Golledge and Stimson [4]. More recently, Spanish researchers have been using the images of places and the ranking of spatial preferences as learning tools in the education of geographers [5]–[7].

In fact, the representation of the relative location of places gives us the environmental perception of individuals, as the image they have of spatial information is dictated by their place of birth and their residence, actual or past, meaning, by their personal history in the place under scrutiny, as well as by their geographical education [8]. This is particularly evident in case of mental maps of cities and metropolitan areas, because spatial information is centered upon the location of our home. Navigation along streets in urban environments was developed in “The image of the city”, by Lynch [9], giving way to the definition of five key elements present in the design of mental maps: (1) Neighborhoods; (2) Paths, like railways or streets; (3) Nodes, such as squares; (4) Edges or border limits; and (5) Landmarks, such as hills, towers, and public buildings.

In current study, we’ve used spatial information about the city of Lisbon and the Metropolitan Area of the capital city of Portugal (AML) as an educational strategy designed



to encourage geographical learning, intended to fill the gaps in the student's locational ignorance, during the lectures and the fieldwork conducted in the Urban Geography classes, from the Institute of Geography and Spatial Planning (IGOT). As the university went online from the 10th of March 2020 onwards, fieldwork became an impossibility, because of the declaration of emergency dated 18th March 2020, valid for all Portuguese territory. In alternative, the Urban Geography class was asked to present several written essays, using Google Earth and Street View tools, and to post them or send the conclusions, together with accurate AML and Lisbon Municipality maps, to us.

Instead of fieldwork conducted in groups of five to six students in several municipalities, located in the axis Lisbon-Vila Franca de Xira, to the orient of the northern part of the metropolis (see Fig. 1), the Urban Geography students had to identify the three main street grids, existent within the AML: (i) rectangular; (ii) irregular; and (iii) radio-concentric. To complement their assignment on the issue of urban morphology, the research further included the examination of three main square designs: (i) monumental; (ii) traffic squares; and (iii) gathering or reunion.

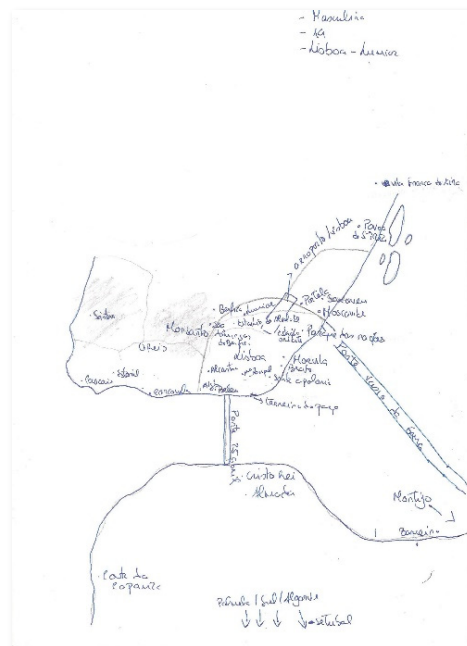


Figure 1: Mental map of the AML. (Source: Class 2019/2020.)

The initial objective of the project was to compare their vision of the Metropolitan Area of Lisbon (AML) drawn in their mental maps, with the subsequent research conducted *in situ*, and aimed at the investigation of urban planning issues that needed intervention and change. With the pandemic virus crisis, the learning process included no fieldwork but solely online work, as said. The structure of the paper, after this introduction, will explain the material and methods employed, then will include the presentation and the discussion of the results gathered during the second semester of the scholar year 2019/2020 (February–July 2020), illustrated with tables and figures of individual non-identified drawings and

several Google Earth maps and Street Views presented by the students groups, towards a conclusion.

2 MATERIAL AND METHODS

Materials used were threefold: (1) A blank sheet of paper and a pen or a pencil, to be used in mental map design; (2) A questionnaire with the place of birth, places of residence, educational background and plans for the future, to be filled in by each student; and (3) Google Earth maps and Street Views of the geographical areas under scrutiny, presented in group assignments, during the online course of Urban Geography. The first two sheets of paper – the one containing each individual student mental map of the AML or Lisbon, at their choice – and the second – the enquiry sheet with the answers to the questionnaire– were given back to us, together. Table 1 presents the characterization of the students under study in this research project, by age and by sex.

Table 1: Personal data of the students.

Age	Student's sex		
	Males	Females	Total
18–19	14	7	21
20 or more	1	1	2
Total	15	8	23

Methodology followed previous work conducted in 2007 and 2008, in remote Southern Hemisphere islands–Mozambique and East Timor–among high school teenagers [8], together with recent research led in the IGOT, among university students [10]. Because this second line of investigation targeted specifically the urban realm and not Planet Earth, current project generally followed the methodology proposed by Lynch [9]. The first attempt to analyze the image that university students have of a Lisbon neighborhood was developed in 2019, and the results were published in a scientific journal, in Spain [11].

3 RESULTS AND DISCUSSION

Mental maps are sketches of our world, continent, country, city or neighborhood sensed from reality or memorized from cartography, coded, stored in our memory and organized according to our preferences and personal interests. They are usually distorted, incomplete and schematic drawings of the truth [4]. Mental maps are, however, good behavioural and perception tools that can be used to research individual preferences. They are also a good starting point in geographical learning, permitting to feed students curiosity about social, cultural and economic facts, intended to stimulate further study to fill in the blank spaces in their drawings, thus, allowing to design more accurate maps and data about the world around them. For two years we've been using mental maps as a teaching strategy in the Institute of Geography and Spatial Planning, acronym IGOT [10]. Fig. 1 reproduces a Lisbon student mental map, representing his view of the AML. On the top of the page, he mentioned his age (19 years), sex (Masculine) and place of residence (Lisbon, Lumiar neighborhood). Fig. 2 copies a Google Map of the same metropolis.

Table 2 presents the place of birth of the students that completed the Urban Geography classes with success. Only twenty-three of those students were present in the first classes and designed their mental maps, handed back to us together with an enquiry sheet. Some students were born in Madeira Island, in Alentejo or Algarve (South of the country), a





Figure 2: Google Lisbon Metropolis (AML) image.

Table 2: Places of birth of the students.

Municipality or location	Student's sex		
	Males	Females	Total
Lisbon municipality	8	—	8
Other AML municipalities	3	3	6
Other location in the country	4	5	9
Total	15	8	23

couple in Torres Vedras, located outside the AML. They lived in Lisbon, in student residences or with relatives and friends, but some of them returned to their official residence during confinement, so that they could be with their families. There was, however, one student from Algarve that we realized had stayed in Lisbon, during the pandemic virus lockdown, away from relatives.

Table 3 represents the residence of the students as stated in the enquiry sheet. During the pandemic virus lockdown we've handed out another questionnaire, by email, in order to inquire the students' actual location, as the classes went online. Only four of the twenty-three students gave back that second questionnaire, as for obvious privacy reasons they were not obliged to hand it back. As read in the table, fourteen students live in several other municipalities around Lisbon city, within the Lisbon Metropolis. Five students stayed outside the AML, as they lived not far away from IGOT, and could travel by train during the school year. The assumption is that they continued do live there, with their families, for the rest of the semester.

Table 3: Places of residence of the students.

Municipality or location	Student's sex		
	Males	Females	Total
Lisbon municipality	3	1	4
Other AML municipalities	8	6	14
Other locations in the country	4	1	5
Total	15	8	23

The drawings of the five students grown and resident outside the AML represented the metropolis in a quite schematic and incomplete way. They presented the following elements: (i) border lines for the coastal and River Tagus limits; (ii) dots representing cities and urban suburbs, not always correctly positioned, such as: (a) Cascais, Sintra, Oeiras, Ericeira, Algés, Loures, Vila Franca de Xira, in the northern part of the metropolis; (b)

Almada, Costa da Caparica, Moita, Pinhal Novo, Setúbal, in the southern part. Fig. 2 shows the structure of AML and its image in a Google View. The connection between the two Tagus River margins can be done by three main bridges, even though only two are visible in this section of the metropolis reproduced.

Similarly, in Fig. 1 the IGOT student clearly and correctly represented the same couple of bridges, tagging them: Ponte Vasco da Gama (the longest one) and Ponte 25 de Abril (the shortest). The author is a Lisbon resident, as said. However, we stress that the students that live outside the AML only represented 25th April Bridge. In fact, this group of outsiders gave us just three key elements in their mental maps, less than the drawings analyzed by Lynch [9]. Moreover, one of those so-called outsiders only represented the railway station where she took the train back home, as well as the metropolitan lines she took in her daily trips to the university, to attend classes.

The second group of students includes the majority that was born, grown and that lives inside the AML, totaling 18, 78% of those drawers who handed back a mental map of the metropolis. This group of Lisbon Metropolis residents can be subdivided in five: (1) Residents in the western neighborhoods of the AML (five students); (2) Residents to the orient of Lisbon municipality (three students); (3) Residents to the North of the capital city of Portugal (four students); (4) Residents to the south of Lisbon and Tagus River (two students); (5) Residents in Lisbon city (four students).

The first subgroup of students comes from the most favorable residential areas in the country, usually inhabited by high-income families. This is a locational evidence in several other Northern-Hemisphere urban centers, as they are placed by the Atlantic sea and have favorable wind circulation that minimizes pollution [12], [13]. These are the most informative mental maps targeting the city of Lisbon (see Fig. 3), but mostly the AML. The elements represented in AML mental maps are: (i) dots locating the neighborhoods, urban centers and cities located along the Atlantic coast, sometimes following the railway stations; (ii) the three Tagus River bridges, sometimes with the location they have when seen by car from the highway that connects Lisbon with Setúbal (South of AML); and (iii) they represent detached elements or landmarks, such as Jesus Christ Statue, in Almada. These mental maps present the 5 key elements described in the work of Lynch [9].

In Fig. 3, Lisbon squares are correctly represented but avenues and streets that connect them are incomplete. This is because the 18 year old student usually travels from Carnaxide to Lisbon, by train, using the Cascais-Lisbon western train connection, and then, he commutes the Metro lines. Therefore, the main squares of Marquês de Pombal, Saldanha, and Chile are represented in his drawing, because they are metropolitan line stations. In fact, his mental map started in Terreiro do Paço, the central monumental and historic square, so-called “the living room of Lisbon”, where, by the way, the assignment for the Urban Geography classes fieldwork was supposed to start. Then he represented other squares that he knew but failed to link them together. The avenues he knows – Avenida da República, Avenida Almirante Reis and Avenida Guerra Junqueiro – and the road – Rua Morais Soares – connect several metro stations, and follow the Metro lines. Besides that he also represents two gardens, both accessed by Metro stations – Alameda D. Afonso Henriques (Metro Alameda) and Parque Eduardo VII (Metro Marquês de Pombal). No surprise, he lives in the municipality of Oeiras, to the west of Lisbon municipality, and he is obviously not used to stroll along Lisbon streets.

The elements the IGOT student drew were: (1) Neighborhoods (Alameda and Almirante Reis); (2) Paths, like roads and avenues; (3) Nodes, such as squares; (4) Edges or border limits; (5) Landmarks, such as the monumental squares and the parks and gardens. It is

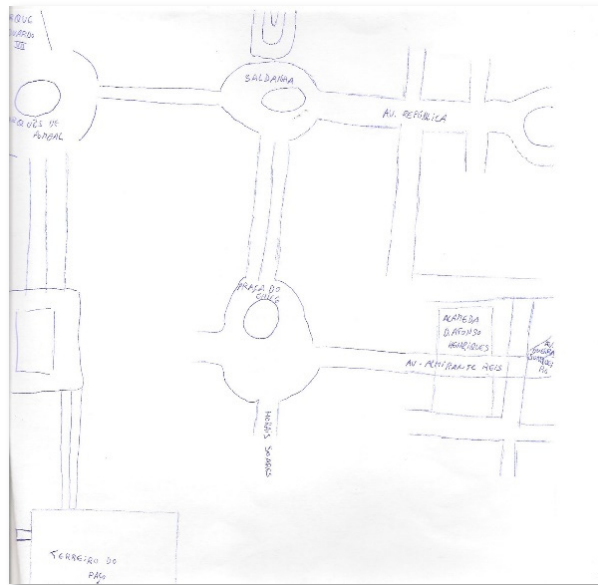


Figure 3: Mental map of Lisbon. (Source: Class 2019/2020.)



Figure 4: Street view of Terreiro do Paço Square in Lisbon (west is upwards).

interesting to emphasize that this mental map presents some similarities with the properties of a Mozambican Island 13 year old mental map [8], drawn with a similar cardinal orientation (N–S) and leftwards, as in a written discourse typical of western languages (from left to the right hand side), generating subsequent distortions in orientation, distance and shape of the city.

Because these sketches were so informative, Fig. 5 reproduces a female student mental map, where it is possible to understand that the knowledge she has of Lisbon metropolis is dictated by her daily travels to IGOT, by train and Metro. (1) In this drawing she signals the University campus where the Institute (IGOT) is situated, in itself a neighborhood; (2) Nodes are the train and railway stations, like Cascais, Monte Estoril, S. João do Estoril and S. Pedro is blurred (see Fig. 6). Then come the metropolitan stations, such as Campo Grande, part of the so-called Green line (verde, in Portuguese); (3) Paths but also border limits are the lines and the bridge, the 25th of April crossing towards the Southern margin of the metropolis; (4) The port of Lisbon marks another edge or border, correctly situated in

connect Lisbon with suburban Northern neighborhoods and cities; (iv) only one Tagus bridge – 25th April – connecting the Northern and Southern margins of the Metropolis. We stress that they also drew the five key elements studied by Lynch [9].

One of the two residents to the south of Lisbon eligible for this project gave the first outline of the railway that connects the Southern part of the Metropolis with the North: (i) the bridge over Tagus River where the train circulates – 25th April (see Fig. 7); (ii) the railway stations dotted, from Entrecampos and Roma-Areeiro (N), close to the university campus located in Lisbon, towards Setúbal (S); (iii) detached buildings like the IGOT (Fig. 8) and Jesus Christ statue, in Almada; (iv) border lines of the Atlantic coast and the Tagus river margins. We emphasize that this female student also drew the five key elements studied by Lynch [9]. Again, she drew a utilitarian mental map.

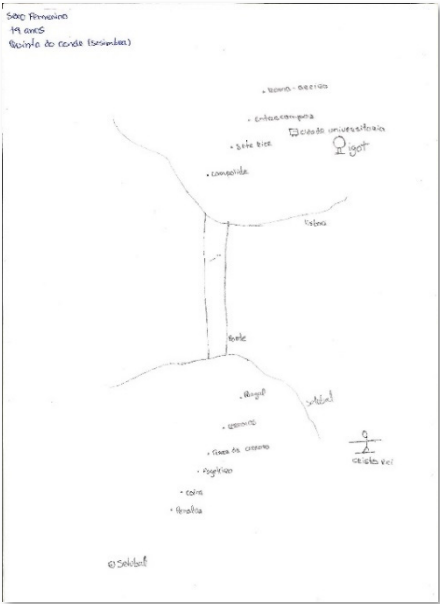


Figure 7: Mental map of a Quinta do Conde student. (Source: Class 2019/2020.)



Figure 8: IGOT building, Lisbon University campus. (Source: IGOT website.)

The last subgroup of students lived and grew in Lisbon municipality. Their mental maps represented the following elements: (i) border lines of the Atlantic coast and the Tagus river margins (see Fig. 1); (ii) the two main bridges over Tagus River – 25th April and Vasco da Gama; (iii) dots representing several Lisbon paradigmatic sites, such as Terreiro do Paço (Figs 1 and 4), the Orient Railway Station and Santa Apolónia Railway Station (Fig. 1); (iv) landmarks like Monsanto hill with park (Figs 1 and 2), Alvalade football stadium (Fig. 1), the Jesus Christ Statue in Almada (Fig. 1); (v) the metropolitan and railway lines with stations dotted, representing neighborhoods, like Belém, Alcântara, Benfica, Parque das Nações; (vi) monumental squares, such as Marquês de Pombal (Figs 1, 3 and 9). We stress that these four Lisbon city students also drew the five key elements studied by Lynch [9].



Figure 9: The monumental Marquês de Pombal Square.



Figure 10: Radio-concentric grid from Madre de Deus neighborhood.

3.1 Student's plans for the future

Table 4 presents the future plans' list for the universe of students under scrutiny. First and foremost they plan to finish their Honors degree, six of them aim the subsequent Master's degree, and only seven of them have more distant planning, regarding employment, namely as cartographers (two), schoolteachers (two), NGO workers (one), researchers (one) and municipality functionaries (one). Three students had no idea about their future, as they left a blank space in this question. The four students that filled in the subsequent questionnaire, during confinement, were more immediate in their wishes: (i) they wanted to be able to go to the beach (three); (ii) to be with their family (two); (iii) with friends (three); (iv) to go back to IGOT (two); (v) to go to the movies (1); (vi) to exercise (one); (vii) to go to a restaurant and party (one).

3.2 Student's essays and the cartography presented

Urban Geography students have submitted three essays during the semester. Only one is admissible for analysis in the current paper. The class was asked to identify the three main street grids, existent within the AML: (i) rectangular; (ii) irregular; (iii) radio-concentric. Fig. 2 represents a Google map of the Metropolis, presenting the two main bridges over Tagus River and clearly a green spot corresponding to Monsanto hill and its public park.

Table 4: Students' plans for the future.

Type of planning	Student's sex		
	Males	Females	Total
Finish the Honors degree	5	2	7
Finish a subsequent Master's degree	4	2	6
To become a geography teacher	1	1	2
To become a cartographer (GIS)	1	1	2
To work in a municipality	—	1	1
To work in an NGO	—	1	1
To research physical geography	1	—	1
No plans	3	—	3
Total	15	8	23

Fig. 4 reproduces a Street View of the rectangular Baixa or Central Lisbon neighborhood, where the monumental Square called Terreiro do Paço can be spotted. Fig. 10 represents the radio-concentric grid of Madre de Deus neighborhood, located to the North-East of Baixa and of Monsanto, where the students have signaled the grid using the Windows tools. This way the groups of designers were able to illustrate their essay about the history and geography of the neighborhoods they selected.

To complement their assignment on the issue of urban morphology, the research proposed further included the examination of three main square designs: (i) monumental; (ii) traffic squares; (iii) gathering or reunion. Fig. 5 reproduces another Lisbon monumental square, Marquês de Pombal, located to the North of Baixa, as well as the high-income shopping Liberty Avenue and Edward the 7th Park, located northwards the tree shaded boulevard, either. This way students reproduced online cartography, copy-pasting the Street View images and Google Earth maps, as well as panoramic photographic views of squares and boulevards, yet they were not innovative in their assignments, as previous Urban Geography classes were, because they could not stroll along the streets, interview traders and residents, nor photograph streets and squares themselves.

4 CONCLUSIONS

In spite of the lockdown the University of Lisbon imposed, dated the 10th March 2020, due to confinement of both students and professors, a national governmental measure, it was possible to overcome some movement limitations as, using Google Earth and Street View tools, the Urban Geography class examined in detail the urban morphology of the AML, and was also capable to successfully explain the evolution of the street grids and squares selected for their group assignment. By contrast, the impossibility to stroll along the roads, to inquire city residents, service providers and traders, prevented the IGOT students from acquiring the necessary skills to propose urban renewal. Conclusion was that online work makes reproductive research plausible but innovation research is highly unlikely achieved. The usage of mental maps as a teaching strategy is, however, a good option, both in online and in-person Urban Geography classes.

Mental maps, also known as cognitive maps, are individual and very simplified versions of the City or the Metropolis, usually quite utilitarian, in the case of female drawers and more informative, in case of males. Lisbon city residents were more capable of designing the urban landscape situated close to their residence, but also more able to represent the whole metropolitan area. Residents outside Lisbon, who were more informative about the

capital city, came from the western part of the metropolis. As stated by a French geographer, Suzanne Daveau, who lived in Lisbon for most of her life, the Metropolitan area has 2,569 km², but the most impressive element for tourists is the Tagus River estuary, a liquid mass of 261 km² [13]. The students' drawings also proved the Tagus River and bridges as key features in the image of the capital city of Portugal, for IGOT Geography learners.

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