



Cartography M.Sc.

Master's thesis

The role of emotions in mental maps

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2021

The role of emotions in mental maps

submitted for the academic degree of Master of Science (M.Sc.)
conducted at the Department of Aerospace and Geodesy
Technical University of Munich

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Date of submission: 05.11.2021

Statement of Authorship

Herewith I declare that I am the sole author of the submitted Master's thesis entitled:

'The role of emotions in mental maps'

I have fully referenced the ideas and work of others, whether published or unpublished.
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Dresden, 05.II.2021

Mariam Gambashidze

*“It is only with the heart that one can see rightly;
what is essential is invisible to the eye.”*
- Antoine de Saint-Exupéry

Acknowledgements

I am very grateful to have been a part of the wonderful program of M.Sc. Cartography. These last two years were very special and valuable for me. I am happy to have had opportunities to study and live in the three beautiful cities, Munich, Vienna, and Dresden, and once again to combine all of them during my thesis semester. Along my 'carto-journey', first of all, I would like to express my gratitude to the coordinator, my supervisor, and a very positive and simply wonderful person Juliane Cron without whom I cannot imagine either our program or my research. I remember our very first correspondence when I still was in Georgia; I remember our first exciting talk about mental maps, and I remember many more valuable moments for which I am thankful.

I want to express my special gratitude to all the participants of my user studies; without whose beautiful mental maps I could not write any of these lines now. I am thankful for your contribution and for letting me be your companion while travelling in your mental images during the interview sessions that were so exciting for me.

These two years could not have been as beautiful without my dear friends from the nice 9th intake as they were. You are such special and great cartographers and very important people to me. I am so grateful and lucky to have you throughout this time. If I were asked to draw a mental map now, it would be related to our countless happy memories, funny stories, and lots of smiles.

And I am grateful for all those people, in different parts of the world, who were next to me during the process, who supported and encouraged, who have been thinking of me, and who were making the world more colourful with their words and smiles. I cannot list all of those people's names here as I will need to add another appendix to this thesis, but I thank each of you individually and warmheartedly.

Abstract

This thesis research looks into the aspects which shape the mental image of a place as it is perceived and experienced by individuals. A synthesis of different methodologies has been applied to collect, analyse, and interpret the data that have been obtained in two user studies. The research aims to explain a connection between emotion and mental maps. Furthermore, the study intends to compare differences between the mental images that are drawn before getting well-familiar with and after living in a place. The research focuses on exploring the personal understanding of the place, which is affected by cognitive memory (i.e. patterns stored in memory through experience and repetition), existing knowledge, emotions, associations, and experiences. The visual language of mental maps and emotional attachments to places have been studied based on mental maps, questionnaires, and interviews. A combination of visual (i.e. mental maps hand-drawn by participants) and verbal language (discourses on the drawings and questionnaires) have been used to give different insights to understand the mental image of a place.

Vienna was chosen as a case study site due to its highly imageable character. This character is comprised of elements such as recognisable landmarks, vivid urban identity, and memorable features created by its history, inhabitants, and visitors. All these elements have perceptual importance and evoke a strong and easily identifiable image of the city enriched with the remembered experiences of and emotional attachments to Vienna. The participants of the user studies were a cohort of students of the International Master program in Cartography who had not lived in Vienna before and moved there for their studies. The first user study was completed via a video conference before participants moved to Vienna. The study consisted of questionnaires, a narrated presentation about the 'Vienna city walk' (a virtual tour), and a mental mapping activity. The second user study was conducted on-site after participants of the first user study had moved to and been living in Vienna for over three months. In this latter study, different methods were combined again, such as 'Vienna city walk' (on-site), mental mapping, questionnaire, and interviews. The outcomes of both user studies were 48 hand-drawn mental maps as well as qualitative and quantitative data from the above-mentioned questionnaires and interviews. The mental maps were investigated by turning them into a tabular format for the categorisation and further analysis of the map elements. Likewise, other qualitative and quantitative data was structured, categorised and quantified.

Analysing emotions related to the mental maps drawn before becoming well-acquainted with the place and after gaining the living experiences reflects the image of the city. This image is defined by personal, recent, and cognitive experiences, associations, and emotional states at the time of mental mapping. Mental maps of the

city illustrate those elements that have personal relevance for a map-maker, i.e. they mainly show associated, favourite, important, and emotional landmarks and places. The participants' emotional attachment to the places grows as they become acquainted with the city; accordingly, mental maps become more accurate and entail more elements. Having similar recent experiences (such as a 'Vienna city walk'), however, does not ensure a similar visual outcome; mental maps may significantly differ from time to time and person to person. The user studies have shown that landmarks and places falling in certain categories have perceptual importance and evoke a strong and easily identifiable image of the city enriched with remembered experiences of and emotional attachments to Vienna.

Keywords: mental maps, emotions, places, image of the city

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I Introduction

I.I Motivation and problem statement

Mental mapping is “visual speaking through places what words alone cannot articulate”; it can be seen as a method of exploring subjective meanings of the space, conveying knowledge and experiencing it in a different form (Giesecking, 2013). Mental mapping crosses many disciplines such as cartography, psychology, environment-behaviour studies and its history dates back to the beginning of the 20th century. However, the turning point for research into environmental cognition and using mental mapping as a method followed Kevin Lynch’s (1960) book ‘The Image of the City’ (Downs & Meyer, 1978), which focuses on designing a legible city (Giesecking, 2013). In his work, Lynch questioned how inhabitants perceive their environment, what elements form a place and therefore the image of the city, and how cities can be organized in a better way (Lynch, 1960). The method of mental mapping has expanded over time; still, the questions remain: how can one use mental mapping as a research method, and what benefits does it provide (Giesecking, 2013).

Besides mental mapping, the role of emotion also falls outside the main scope of traditional cartographic research. The focus of historical cartography has mainly been representing visible and tangible phenomena (Griffin & Mcquoid, 2012; Panek et al., 2017). Whereas the study of the emotional component and human experiences in human-environment relationships is rarely considered and does not have a long history in the field of cartography (Griffin & Mcquoid, 2012; Pearce, 2008).

Places and emotions are related to each other and these relationships are complex (Caquard & Griffin, 2018). Places can evoke various emotional responses, which can be translated into mental images. Panek et al. (2017) note that these responses are studied in emotional cartography by different means such as biometric measurements (Nold, 2009), user-generated content (Hauthal & Burghardt, 2016), and surveys (Huang et al., 2014). It is not well understood, however, how emotions influence attitudes and behaviour towards a place. Furthermore, if one considers how mental images are not static but fluid and dynamic, then one may ask how they change as knowledge and experience about the place grow.

The thesis aims to explain the connection between the emotion and mental maps, on the one hand, and compares the differences between the mental images that are drawn before visiting and after exploring and

living in that place. The focus of the study lies on exploring the personal understanding of the place, which is affected by the cognitive memory (i.e. patterns stored in memory through experience and repetition), existing knowledge, emotions, associations and experiences. The visual language of mental maps and emotional attachments to places will be studied based on mental maps, questionnaires and interviews. A combination of visual (i.e. mental maps drawn by participants) and verbal (discourses on the drawings) language will give different insights to understand the mental image of a place as it is perceived, experienced and shaped by the individuals.

1.2 Research identification

This thesis aims to enrich the understanding of the role of emotion in mental maps, and to explore the aspects which shape the mental image of the place as it is perceived and experienced by individuals. Other objectives of this work are to synthesise existing methodologies and suggest how to analyse and interpret mental maps. This work contributes to the field of cartography and psychology, as well as to social and environmental studies. It can also be beneficial for urban planners to work on developing of the city, i.e. creating a better city image, which pleases its inhabitants, as well as its visitors.

Within this thesis, Vienna is chosen as a case study area due to its highly imageable character. This character is comprised of elements such as recognisable landmarks, vivid urban identity, and memorable features created by its history, inhabitants, and visitors. All these elements have perceptual importance and evoke a strong and easily identifiable image of the city enriched with the remembered experiences of and emotional attachments to Vienna.

The main research objective is to explore how emotion influences the mental maps created before and after visiting a place (Vienna). This main research objective is further broken down into the following three sub-objectives (RO) and respective research questions (RQ):

RO₁ - Understand mental maps of a city drawn by the participants and their emotions before visiting the place.

RQ₁ - How are the image of the city and personal emotions perceived by the participants before visiting the place?

- a. What are already existing associations related to Vienna?
- b. How does the use of different media such as maps, images, videos, text, and narrated stories impact the perceived image of Vienna and evoke emotions?

RO2 - Understand mental maps of a city drawn by the participants and their emotions after exploring and living in that place.

RQ2 - How are the image of the city and personal emotions perceived by the participants after exploring and living in that place?

- a. How did the participants' image of the city and emotions change based on their personal experiences while living in Vienna?
- b. How does the on-site experience – Vienna city walk – shape the mental images of the city and influence personal emotions?

RO3 - Explore the relationship between emotions and places and its influence on shaping the mental image of a city.

RQ3 - How are personal emotions connected to places and how does it shape a mental image of a city?

- a. What are the most significant landmarks and places of personal relevance in Vienna and why are they memorable?
- b. What kind of emotions does the mental mapping evoke for a map-maker and how can these emotions affect the mapping process, as well as its outcome?
- c. What are the similarities and differences between the emotions and the mental images drawn before and after visiting the place?

This thesis does not aim to seek objective emotional data (e.g. collected them with the help of a device, which can track the change of emotional state of the user), but rather to comprehend subjective visual representations of a place, enriched by the verbal narrations. It is neither an attempt to create a composite map derived from the analysis of unique individual mental maps.

The hypothesis guiding this research is that emotion has a compelling influence on a mental image of a city. Emotional attachments to the places grow by becoming acquainted with the places and collecting experiences. Having similar experiences, however, does not ensure a similar visual outcome; mental maps may significantly differ from person to person as they are affected by the associations, existing knowledge, and personal experiences. Yet, using mapping, as well as qualitative and quantitative methods of data collection, cannot assure that emotions can be easily tracked and described in mental maps and narrations.

1.3 Thesis structure

Chapter 1

The introduction chapter outlines the context of this thesis. It explains the aim of the research and background information about mental mapping and the study of emotions in the field of cartography. The problem statement is followed by the research identification, where research objectives and questions of the thesis are laid out. Furthermore, the scope and interdisciplinary contribution of this paper is presented, as well as the hypothesis which guides this research.

Chapter 2

The literature review introduces two main research areas of the thesis: mental maps and emotions. The subchapters are structured similarly. Both start with an overview of the notion and context of each research field, its history and interdisciplinary nature. The general reviews of each subchapter then go deeper into the evaluation and measurement approaches of mental maps and emotional responses. The subchapters close with a focus on how cities are perceived and how emotions are depicted in maps, respectively.

Chapter 3

The methodology chapter includes research methods that were used in this study to answer the research questions and accordingly to meet the research objectives. After representing a general research design framework, the two – first and second – user studies are introduced and described in detail. A similar structure of each user study is further broken down into the constitutive parts to show the implementation of research methods used in this research. This is followed by giving insights into the interpretation methods used for the diverse resulted data of both user studies.

Chapter 4

The result and discussion chapter shows and explains the findings of the first and second user studies. The chapter follows a structure of research objectives and corresponding research questions. Thus, in the beginning, the findings of the first user study are illustrated, followed by the second user study. Then the mental image of the city and emotions attached to places are discussed.

Chapter 5

Finally, the summary and outlook chapter presents the main research findings. It also identifies the limitations of the study and provides recommendations for future research.

2 Related work

This chapter offers a review of related work and is focused on the two main areas of the thesis: mental maps and emotions in cartography. It begins with a brief historical overview of mental maps and their development as a research method (section 2.1). Explanation of the meaning of mental maps (section 2.1.1) contributes to a foundation to discuss the methods that have been used to analyse these graphical representations and understand the perception of the environment (section 2.1.2). Subsequently, great attention is given to the major works which studied city perception in combination with different methodologies, including the aforementioned mental maps (section 2.1.3). Another focus of this chapter is on the context of emotions studied in the field of cartography (section 2.2). The complexity of emotion and the understanding of its definition requires a look into the literature of different fields (section 2.2.1). Furthermore, this chapter gives a comprehensive overview of different methods of recording and measuring individuals' emotional responses (section 2.2.2). Consequently, section 2.2.3 goes deeper into the works that aimed to depict various affective responses and emotional connections to the places.

2.1 Mental maps

Mental maps have a long and interdisciplinary history (Dernat et al., 2016; Saarinen, 1987). The earliest research of mental maps within the cognitive studies of geographical space dates back to the beginning of the 20th century (Vinha, 2012). The early paper of psychologist Edward Trowbridge, where the author used a method of “imaginary maps” to study sense of orientation and direction in an unfamiliar region (Trowbridge, 1913), is considered to be the first systematic approach in the field (Downs & Meyer, 1978; Giesecking, 2013; Mark et al., 1999; Vinha, 2012). The modern period of mental maps and cognitive studies of the geographical environment began with Edward Tolman (1948), who coined the term *cognitive map* in his paper ‘Cognitive maps in rats and man’ (Mark et al., 1999; Saarinen, 1987; Vinha, 2012). However, the watershed moment for research into environmental cognition followed Kevin Lynch’s (1960) book ‘The Image of the City’ (Downs & Meyer, 1978). Lynch suggested using mental maps to understand how individuals perceive their spatial environments (Reuchamps et al., 2013; Vinha, 2012). Lynch and mental mapping have been inspiring and influential not only in the field of urban studies (Vinha, 2012) but in various disciplines such as urban planning, geography, psychology, etc. (Giesecking, 2013; Mark et al., 1999; Saarinen, 1987; Vinha, 2012). Followed by Lynch’s seminal work, studies related to mental representations of the environment have become increasingly popular, firstly in geography and psychology, and later in the social and cognitive sciences (Reuchamps et al., 2013).

2.1.1 Mental maps definition

A mental map is a graphical representation of a certain object or space (Dernat et al., 2016; Reuchamps et al., 2013) that is derived from an individual's or group's cognitive map (Giesecking, 2013). This visual representation is usually hand-drawn on a blank sheet of paper and shows the subjective reality of space as it is imagined by an individual and remembered using personal and social memory (Dernat et al., 2016; Gueben-Venière, 2011). However, it is not always the case that a mental map is sketched on a blank sheet of paper; mental mapping is also understood as the process of adding features and/or labels to an existing map; mental maps can also be created using computer software (Giesecking, 2013).

The mental map is a construct and a representation of our cognitive map (i.e. knowledge), which helps to organize and understand spatial information and environment (Dernat et al., 2016; Kitchin, 1994). These graphical representations hold a cognitive and an emotional components (Milgram & Jodelet, 1976). Mental maps are products of individual mental representations, such as personal experiences, cultural or educational background, as well as social representations, i.e. representations shared by certain groups (Gueben-Venière, 2011; Milgram & Jodelet, 1976). Therefore, these dynamic images are different according to cultures, environments, psychological nature of the person, etc. (Lynch, 1960).

Mental maps can be thought of both as visual representations and a methodological tool used in different fields, such as social and cognitive sciences (Reuchamps et al., 2013), psychology, and geography. The mental mapping method has also attracted interest in cultural, social, humanist and more lately in environmental geography (Gueben-Venière, 2011).

Due to the multidisciplinary nature of mental mapping, mental maps are also referred to as cognitive maps (Gold & Saarinen, 1995; Kitchin, 1994; Tolman, 1948), psychological maps (Milgram & Jodelet, 1976), mind maps (Reuchamps et al., 2013), sketch maps (Boschmann & Cubbon, 2014; Novotná & Hanus, 2020; Wartmann & Purves, 2017) or mental sketch mapping (Giesecking, 2013).

2.1.2 Evaluation of mental maps

Mental maps are not only spatial representations but also a methodological and analytical tool to understand places and space (Giesecking, 2013; Gueben-Venière, 2011; Reuchamps et al., 2013). The technique of mental mapping allows researchers to understand how individuals perceive their environment (Reuchamps et al., 2013).

Mental maps are multidimensional (Milgram & Jodelet, 1976) and challenging to interpret, therefore they are criticized and often treated with extreme caution (Gueben-Venière, 2011; Reuchamps et al., 2013). A common criticism of the mental mapping method is that it cannot always show existing cognitive images because of different drawing abilities (Giesecking, 2013; Gueben-Venière, 2011; Milgram & Jodelet, 1976; Reuchamps et al., 2013) or the fear of drawing (Gueben-Venière, 2011). Another prevalent criticism of mental maps is the

difficulties of their interpretation (Reuchamps et al., 2013). Some researchers see mental maps as “mere artefacts” (Reuchamps et al., 2013) and “hardly sketched” (Gueben-Venière, 2011) representations and the method of mental mapping as too subjective and unreliable in comparison to other methods (Reuchamps et al., 2013). Others question spatial distortions and discontinuous surfaces of mental maps (Gueben-Venière, 2011). However, mental maps are often used in different research and often in combination with other well-established qualitative methods such as interviews, survey questions, focus groups, etc. (Brennan-Horley, 2010; Giesecking, 2013; Gueben-Venière, 2011; Matei et al., 2001; McKenna et al., 2008; Reuchamps et al., 2013).

According to Gueben-Venière (2011), there are two approaches of using the mental mapping method: (1) freeform mental maps, which ask individuals to express given object(s) or space on the blank sheet of paper by drawing (Gueben-Venière, 2011; Reuchamps et al., 2013), and (2) mental maps created on a base map (consisting of base layers, such as routes, landmarks, etc.), which ask the individuals to enrich the map with certain pieces of information, such as boundaries, representations of urban areas, labels of administrative units, etc. (Brennan-Horley, 2010; Giesecking, 2013; Gueben-Venière, 2011).

Freeform mental maps

Fundamental insights into the mental sketch mapping method are discussed by Giesecking (2013). The author stitches together the work of other researchers, as well as describes and enriches analytical techniques (the methods to explore mental maps) and components (map elements), which he has used in a case study. The case study was focused on human-environmental relations with the example of experiencing the space by the 32 female alumnae of Elite College. Each interview was started with a mental mapping activity (drawing the campus map as they remembered while studying), followed by the verbal part of the interview. The used methodology has been combining individual interviews and mental maps, as well as examining 57 analytic techniques and components. Giesecking groups those analytics into four big categories: (1) Mechanics of method (MOM) – how accurately the mental map represents reality, (2) Drawing elements (DE) – composition of the mental map by its elements, (3) Narratives of place (NOP) – how the place is perceived and experienced, and (4) Personalisation – emotions and personal experiences (Table 2.1). The first two categories show more cartographic aspects used for spatial analysis, while the last two reveal rather psychological and social aspects. Analytic techniques and components suggested by Giesecking are broad and can be modified based on the research aims (Giesecking, 2013).

Analytic	Category	Citation
Sequence	MOM	Lynch, Milgram & Jodelet, Saarninen
Count of drawn elements	MOM	Lynch
Text labelling	MOM	Saarninen, Monmonier
Text labelling: acronyms, slang, abbreviations	MOM	Giesecking
Continued to label map throughout	MOM	Giesecking
Mirror the physical space	MOM	Lynch, Downs and Stea (1977), Devlin

Last residence in place	MOM	Giesecking, Devlin
Frequency of visits now	MOM	Giesecking, Devlin
Reside near place now	MOM	Giesecking
Map elements in relation to one another	MOM	Milgram & Jodlet, Saarninen
Drawing anxiety	MOM	Saarninen, Winnicott
Drawing skills	MOM	Kitchin & Freundschuh
Enjoyed mapping process	MOM	Giesecking
Time limit	MOM	Giesecking
Used of the entire paper	MOM	Giesecking
Mirror the standard map of the physical space	MOM	Lynch, Devlin, Monmonier
Remained focused on drafting the map	MOM	Giesecking
Center	DE	Saarninen, Monmonier
Borders	DE	Saarninen, Giesecking
Use of Color	DE	Devlin, Saarninen, Monmonier
Symbols	DE	Lynch, Saarninen, Monmonier
Legend	DE	Monmonier, Giesecking
Accuracy of scale of included elements	DE	Downs and Stea (1977), Saarninen
Shapes (standard)	DE	Saarninen, Devlin
North arrow	DE	Monmonier, Giesecking
Projection	DE	Monmonier, Giesecking
Orientation	DE	Giesecking
Scale of elements	DE	Giesecking
Included elements at various scales	DE	Giesecking
Build environment elements	NOP	Saarninen
Physical environment elements	NOP	Giesecking
Live space in walking through the space	NOP	Powell, Giesecking
Percentage of accurate labels	NOP	Lynch, Saarninen
Districts	NOP	Lynch, Devlin, Powell
Edges	NOP	Lynch
Nodes	NOP	Lynch
Landmarks / Notoriety / Popular elements	NOP	Lynch, Saarninen, Devlin
Paths (and roads)	NOP	Lynch, Devlin
Personal paths	NOP	Giesecking
Access to car	NOP	Giesecking
Went to and from space often	NOP	Giesecking
What is included in out of the ordinary	NOP	Lynch, Devlin
What is omitted in out of the ordinary	NOP	Lynch, Devlin
Subjectivity identifiers	NOP	Giesecking
Cultural factors / tradition	NOP	Saarninen
Discuss emotions through physical space	NOP	Giesecking
Felt close to the space at present	NOP	Giesecking
Remembering intimate spatial details	NOP	Giesecking
Include what possesses personal meaning	P	Milgram & Jodelet
Includes what lacks personal meaning	P	Milgram & Jodelet
Proximity	P	Saarninen
First drawn element	P	Kitchin & Freundschuh

Last drawn element	P	Kitchin & Freundschuh
Includes depiction of self in map	P	Giesecking
Text labelling: all capitals, uneven sizing	P	Giesecking
All buildings given shape	P	Giesecking
Social during experience	P	Giesecking

Table 2.1: Analytic techniques and components, their categories, and sources (Giesecking, 2013).

The french geographer and cartographer Roger Brunet developed so-called *choremes*¹, which are the classes of basic spatial structures and processes in a graphical form (Dernat et al., 2016; Reimer & Fohringer, 2010). Choremes have been used by different authors to understand and interpret the organization of space made by an individual (Dernat et al., 2016). Dernat et al., (2016) extensively used the chorematic method to understand the spatial organizational principles in mental maps (Figure 2.1). The authors aimed to determine how students perceive veterinary practice in rural neighbourhoods by combining mental mapping and discourses. During the study, participants were asked to create a mental map depicting the area of rural veterinarian's practice on an empty paper and to give verbal comments while drawing. The authors saw the mental map as a combination of drawn visualisation, recorded discourses and transcriptions (Dernat et al., 2016).

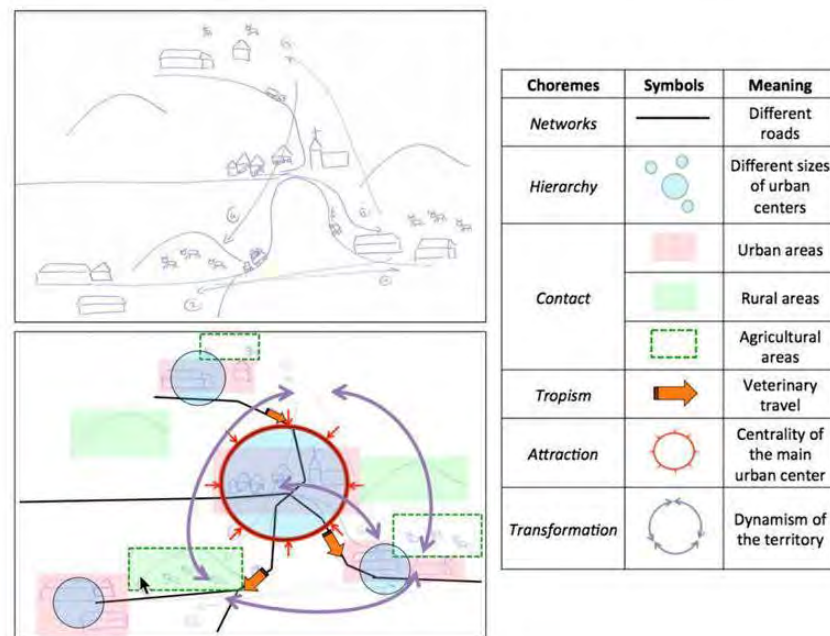


Figure 2.1: Example of chorematic treatments of drawing (Dernat et al., 2016).

¹ The term *choremes* has Greek origin. The prefix *chor* means place or space, and the suffix *-eme* indicates the smallest part of the whole that holds the meaning (Reimer & Fohringer, 2010).

The analysis of collected data combined four methodological tools: (1) characteristics identification - analysing drawings elements, (2) chorematic analysis - analysing presence or absence of certain choremes in drawings and discourses, (3) textual analysis - analysing socio-spatial variables of discourses, and (4) crossed analysis - analysing connections of socio-demographic and the resulted data combined from the aforementioned methods (Figure 2.2). The data collected through mental mapping was studied statistically to reduce subjectivity in interpretation and data sources were compared to one another holistically (Dernat et al., 2016).

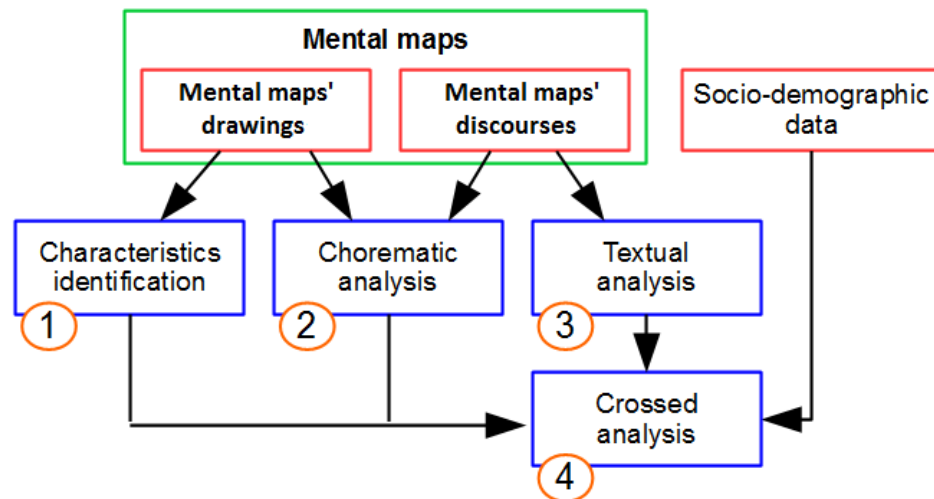


Figure 2.2: Schematisation of methodological treatment of mental maps (Dernat et al., 2016).

Mental maps created on a base map

Spatially-oriented qualitative data, including mental maps, can be analysed and represented by Geographical Information System (GIS) (Brennan-Horley, 2010; Gueben-Venière, 2011; Matei et al., 2001; McKenna et al., 2008). Using base maps (Figure 2.3) for mental mapping has an advantage over freeform mental maps, as they can be georeferenced and further analysed in GIS with various visualisation techniques (Brennan-Horley, 2010). Gueben-Venière (2011) used a mental mapping method (using the predefined base map) in combination with semi-directed interviews to study, the social representation of coast shared by the different groups of professionals (engineers and ecologists). In this study, mental maps were digitised and further analysed with the help of GIS. As a result, a so-called average mental map (Figure 2.3), shared by a group of professionals, was generated (Gueben-Venière, 2011).

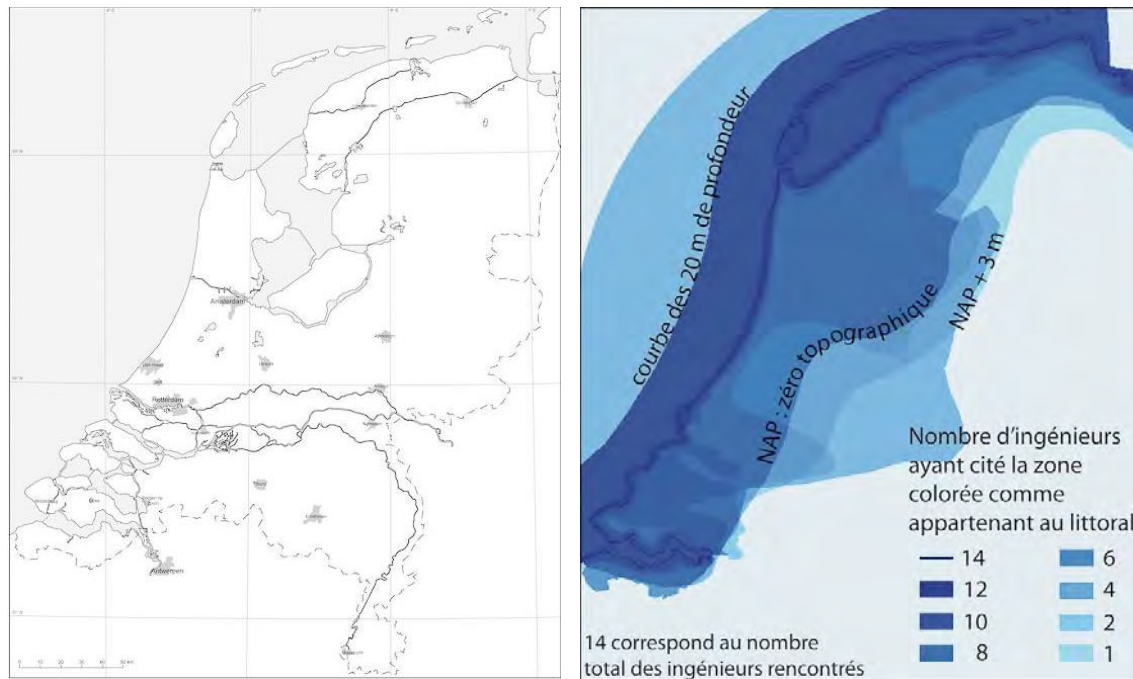


Figure 2.3: Base map of the Netherlands presented to the interviewees (left); average mental map showing limits of the coast according to engineers (right) (Gueben-Venière, 2011).

Another example of using GIS to interpret and present mental maps comes from Brennan-Horley (2010). In his study, Brennan-Horley identified hot spots of the 'creative city' in Darwin, Australia. Respondents were provided with base maps of Darwin (which included boundaries and street network) and were asked to answer some spatial questions and use different colours for drawing on the maps (Figure 2.4). All mental maps made by creative workers were combined, georeferenced and visualised with GIS. In addition, a 3D visualisation² was created (Brennan-Horley, 2010).

² Creative tropical city video. <http://creativetropicalcity.blogspot.com/> (last accessed 08/2021)



Figure 2.4: Example of a completed mental map within the study of 'creative city' Darwin, Australia (Brennan-Horley, 2010).

2.1.3 Cities as they are perceived

Cities are constructs in space (Lynch, 1960) with physical as well as social dimensions (Milgram & Jodelet, 1976). They are not stationary but rather dynamic entities (Lynch, 1960) that change their shape and character. These places are perceived by their inhabitants and visitors and experienced in different ways (Lynch, 1960). Experiences and memories, together with perception and associations related to places form the mental image of the city. Researchers have been interested in finding out how cities are perceived and mirrored in individuals' minds (Lynch, 1960; Milgram & Jodelet, 1976). In the following section, three prominent works which offer an understanding of city images will be discussed: (1) Image of the city (Lynch, 1960), (2) Psychological maps of Paris (Milgram & Jodelet, 1976), and (3) City perception survey (Ichikawa et al., 2016).

Image of the city – systematic use of mental mapping method

In his classic urban planning book, 'The image of the city', Lynch (1960) studies mental maps created by individuals to understand how the city is perceived and organized in people's minds. He focuses on the importance of the *imageability* and *legibility* of the space and their contribution to the formation of the city image for its inhabitants. Lynch states that the formation of the mental image can be influenced by different aspects, such as perception, familiarity with the place, physical form of the object, etc. Each of these aspects can give diverse results and therefore different images of the same environment. The author argues that the mental image of the environment is created based on a two-way process made up of the observer (i.e. individual) and the observed (i.e. places). The environment provides the same physical condition for everybody, while the observer makes a selection and enriches their perceived environment with meanings; in other words, we see the same exterior form of the environment, which is differently organized and interpreted by the individual. Therefore, these mental images vary greatly from one another. With the idea of imageability (also referred to as legibility), the author refers to the visual quality of a physical object, which stimulates forming a strong, easily identifiable and structured mental image of a given environment. This physical quality can be described by the shape, colour, or arrangement and is an important characteristic of the place, which makes it remarkable and distinct (Lynch, 1960).

Lynch (1960) suggests analysing the image of the city taking into account the three following inseparable components: *identity*, *structure*, and *meaning*. In this case, identity means perception and distinction of the object from other features. The structure of the image shows the spatial or pattern relations between the object and observer and other objects. And last but not least, practical or emotional meanings are given to the objects by the individual. Lynch states that meanings are complicated components, as they are less consistent and diverse and hardly affected by "physical manipulation". His study focuses on the first two physical qualities (identity and structure) of the city image and the so-called public image of the city, i.e. the image which share the similar characteristics of individual mental images and is held by a considerable amount of the inhabitants. Furthermore, Lynch classifies five elements of city image: *path*, *landmarks*, *edge*, *node*, *district*, examines relations between them, and their qualities. These categories are described as "contents of city image" that have a physical form (Lynch, 1960).

For his study, Lynch (1960) makes use of two qualitative methods, mental mapping and interviews of three American cities - Los Angeles (California), Boston (Massachusetts), and Jersey City (New Jersey). The methods included: (1) field reconnaissance (resulted in a field analysis map) made by trained observers, and (2) individual interviews (including sketching the mental maps) with 60 citizens, which resulted in a series of images (e.g. derived from sketch maps, verbal interviews, etc.) showing a public image of the cities (Figure 2.5). A small sample participated in the second session of the study, where they had to classify, identify and place the photographs of the cities on their locations. Later the same participants were brought to the field, asked to make their way through the route and give verbal explanations that were recorded and transcribed (Lynch, 1960).

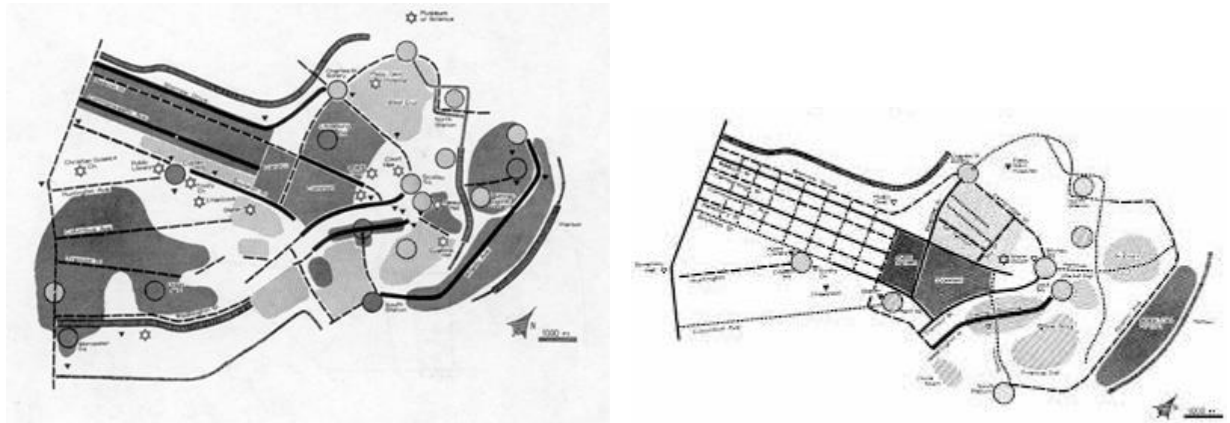


Figure 2.5: *The visual form of Boston as seen in the field (left) and derived from sketch maps (right) (Lynch, 1960).*

With his work, Lynch (1960) argues that mental images reflect the relationships between space and individuals (Powell, 2010). Comprehending how individuals perceive the environment, can contribute to the decision-making process, and guide more effective urban planning and design (Gueben-Venière, 2011; Vinha, 2012).

Psychological maps of Paris – icons and characteristics of the city

Another systematic study related to the image of the city was conducted by Milgram & Jodelet (1976). The authors aimed to find out how Paris is perceived and represented by its inhabitants. Similar to the work of Lynch (1960), Milgram & Jodelet used a combination of the mental mapping method and interviews. In the study, 218 participants (professionals and workers) were asked to sketch their mental maps of Paris including the elements related to their personal experiences (Figure 2.6). The authors focused on analysing the entire collection of maps to reveal the public city image of Parisians. Milgram & Jodelet used the statistical analysis method of mental maps to identify the icons of the city, emerging and major elements (by calculating sequence and frequency, overall and average numbers of drawn elements, etc.), and the connections between these elements (Milgram & Jodelet, 1976).

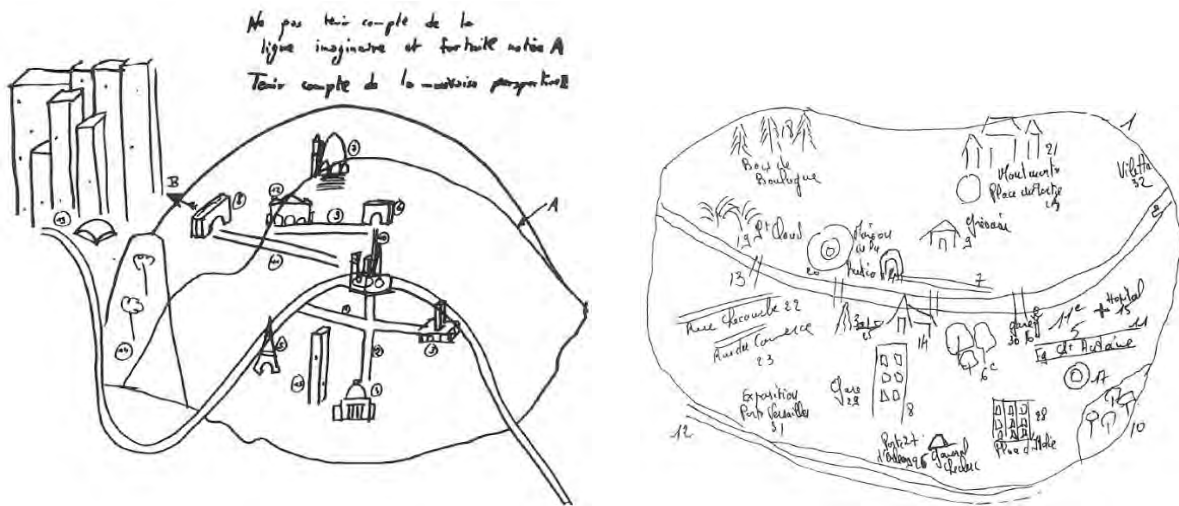


Figure 2.6: Mental maps of Paris (Milgram & Jodelet, 1976).

Milgram & Jodelet (1976) state that sketched representations cannot exactly capture the entire mental map, as they are “clues” rather than the mental images that one has in mind. This fact is caused by the difficulties of expressing internal mental images on paper, choosing proper ways of visualisation, errors while drawing, etc. To overcome these factors, in addition to the “free recall” (used in creating mental maps), Milgram & Jodelet used photographed scenes of Paris that participants were asked to identify. This method enables understanding more about the recognition of certain landmarks, which were not included in the mental maps, but were still active elements of participants’ image of the city. Alongside the overall mental image of Paris, the authors also tried to understand more specific characteristics of the city, such as perceptions of *known and unknown*, *poor and rich*, *liked and disliked* areas of Paris. As shown in Figure 2.7, the data obtained from the participants were visualised into cartographic forms (Milgram & Jodelet, 1976).

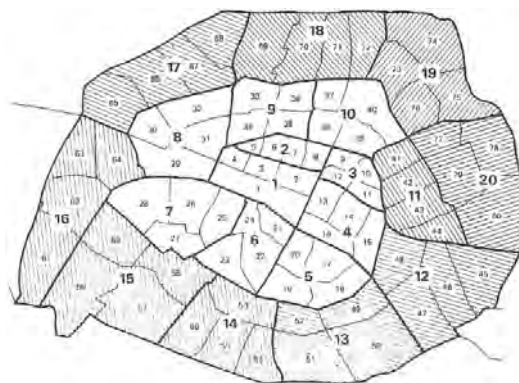


Figure 2.7: Least known areas (shaded) of Paris by arrondissement (Milgram & Jodelet, 1976).

Milgram & Jodelet (1976) argue that psychological maps of the city generated by its inhabitants can reflect the spatial characteristic of the place, which can be difficult to express verbally. Besides, the maps allow being compared with the real physical world. The authors underline the value of mental maps and state that these hand-drawn sketches reflect the cities and their character, i.e. they are not just a collection of elements but structures with certain relations (Milgram & Jodelet, 1976).

City Perception Survey – how global cities are perceived

A recent study about the images of cities was conducted by the Institute for Urban Strategies, the Mori Memorial Foundation (2016). This work aimed to understand eight global cities - London, New York, Tokyo, Paris, Singapore, Seoul, Hong Kong, Shanghai - as they are perceived in people's minds. The work resulted in a visual analysis of the image of each surveyed city. The criteria for choosing target cities were their position in the ranking of the Global Power City Index (GPCI). In comparison to previously discussed studies (Lynch, 1960; Milgram & Jodelet, 1976), the main methodology of the 'City Perception Survey' is not mental mapping, but solely a questionnaire and collected keywords to get an image of each surveyed city. The study included 2132 completed surveys, over 27781 keywords written by respondents from 41 global cities. The data was analysed with different methods such as (1) word clouds – 100 most mentioned major perceptions, (2) ranking – frequency of reported responses, (3) visitor-non/visitor analysis – responses based on visitor-non/visitor, and (4) location-specific analysis – cross-reference of responses with the location of respondents (Figure 2.8) (Ichikawa et al., 2016).

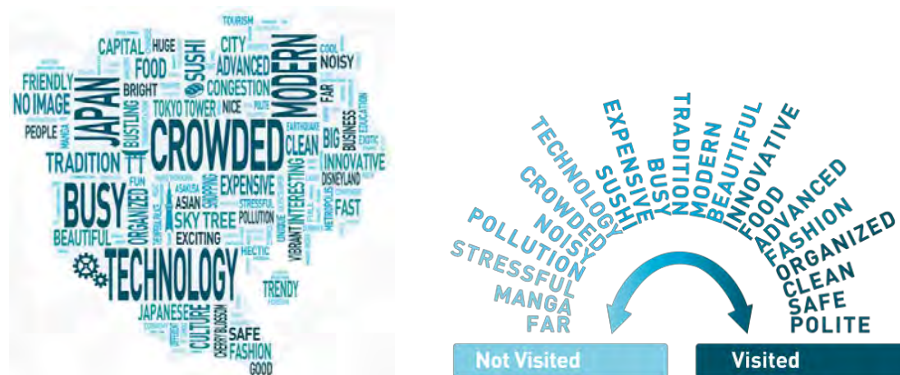


Figure 2.8: Associated keywords to Tokyo represented by word cloud (left); visitor-non/visitor analysis (right) (Ichikawa et al., 2016).

'The City Perception Survey' (2016) also included a comparative analysis using the following methods: (1) total words – grouping collected responses into 19 categories, (2) age and gender – analysing patterns of the 50 most frequently mentioned keywords, and (3) correlation analysis of 8 cities and image responses – illustrating connections between different factors. The given methodologies help better understand the "magnetism" of global cities, as well as their performance, and subjective perception of major urban areas (Ichikawa et al., 2016).

2.1.4 Conclusion

This subchapter has presented mental maps, their development throughout time, and their interdisciplinary usage in various studies. Mental maps reflect mental images of the surroundings which we hold within our minds. These sketched visualisations mirror how individuals perceive their spatial environment and are formed by personal experiences. Mental maps are diverse and vary from one to another. Yet these graphical representations show similarities, as they are also affected by social and cultural backgrounds. The diverse nature of mental maps makes them complex constructs and therefore challenging to interpret. However, there are often different approaches used in combination with other well-established qualitative research methods to analyse mental maps. As such mental maps reflect relationships between space and individuals and enable us to better understand places as they are perceived.

2.2 Emotions in cartography

Emotion is one of the most important characteristics of the human world; however, it is often neglected and rarely represented in maps and the mapping process (Griffin & Mcquoid, 2012; Kwan, 2007). Emotions are complex, and multifaceted constructs (Klettner & Gartner, 2012), and therefore difficult to measure. The emotional component has become interesting for cartography quite recently, yet still, little attention has been paid to it; this may be caused by challenges in data mining and visualisation of emotions (Griffin & Mcquoid, 2012). The approaches for gathering information about emotions can be classified into the following groups: biometric measurements, emotion extraction from user-generated data, and surveys (Caquard & Griffin, 2018; Panek et al., 2017).

2.2.1 Emotion definition

Emotion plays an important role in our lives. However, there is no single agreed-upon definition of *emotion* and the clear distinction between emotion and other affective states (Klettner & Gartner, 2012; Russell, 2003). In daily life, emotion is often interchangeably used with the terms *feelings*, *affect* or *mood* (Caquard & Griffin, 2018; Griffin & Mcquoid, 2012). The meaning of emotion and affect are often considered somewhat similar, as both of them are responses to our interaction with our surroundings; however, there are differences between them (Caquard & Griffin, 2018). Different psychological theories address different components of this phenomenon; Barrett (2006) defines emotion as a core affect meaning that “mental representation of emotions have pleasure or displeasure at their core”; these feelings of pleasure or displeasure can be characterized as arousing or quieting (Barrett et al., 2007). Accordingly, core affects are considered as consciously experienced states which can be described by a two-dimensional continuum with one axis ranging from pleasure-displeasure and another high arousal-low arousal (Griffin & Mcquoid, 2012; Panek et al., 2017). On the other

hand, emotion is a labelled and nameable current core affective state, which can be described differently based on each individual (Bondi, 2005; Griffin & McQuoid, 2012). In other words, affects are non-individualised, they arise from and are associated with the body, whereas emotions are empirically attributed and usually related to the conscious mind and cognition (Bondi, 2005; Caquard & Griffin, 2018). In the cartographic context geographical understandings and perspectives of emotion are taken into account according to which there is a connection between places and emotions (Caquard & Griffin, 2018; Mody et al., 2009). Thus, emotions are relational flow (Bondi, 2005). In other words not only places shape emotions but also emotions shape the place (Caquard & Griffin, 2018).

2.2.2 Measurement of emotions

Emotions are complex and not easy to measure (Klettner & Gartner, 2012), but not impossible. Emotions can be examined in different ways (Caquard & Griffin, 2018; Klettner & Gartner, 2012; Panek et al., 2017). According to Klettner & Gartner approaches that measure emotion, i.e. individual's emotional response, can be grouped into the following categories: self-report, physiological methods, and behavioural observations (Klettner & Gartner, 2012).

Self-reports are used to collect information about the conscious mental state of a person (Barrett et al., 2007). Self-reports can express an individual's experience of emotion in a form of narration, verbal descriptions or emotion scales by rating the emotion words (Barrett et al., 2007; Klettner & Gartner, 2012). However, these most direct ways of collecting emotions only reveal the internal state and do not explain them (Barrett et al., 2007). One example of self-report emotion scales is the PANAS scale suggested by Watson et al., (1988), which includes the positive and negative affect schedule. The PANAS, a two 10-item mood scale model, which consists of 20 words that describe different feelings and emotions, is based on two dimensions - Positive Affect (PA) and Negative Affect (NA). PA reflects positive mood states such as enthusiastic, active, alert, etc., and NA reveals unpleasant mood states such as anger, fear, nervousness, etc. Within the PANAS self-report mood scale, respondents are asked to assign given words a number from 1 (very slightly or not at all) to 5 (extremely) that indicates the extent of their feelings and emotions for the specified time-frame. According to the authors, the PANAS is a trustworthy and valid self-rated mood scale for studying dimensions of emotion (Watson et al., 1988).

Another and more objective way to collect and measure affective responses and emotions are physiological methods, i.e. observing the body's reactions with the help of biometric technologies such as polygraph, electrocardiogram, and Galvanic Skin Response (GSR) (Caquard & Griffin, 2018; Klettner & Gartner, 2012). The advantage of these physiological recordings is that they are neither subjective nor need to be conscious as self-reports (Barrett et al., 2007; Klettner & Gartner, 2012). However, observing body reactions also have drawbacks. Physiological measurements show the change in body reaction, but the recorded change of arousal is not necessarily an affective reaction caused by emotional experience, i.e. evoked by the surrounded external

world; to overcome this factor, there is a need for proper interpretation of the data, which is obtained from physiological recordings and/or behavioural observations, as not every arousal indicates emotional experience (Klettner & Gartner, 2012).

The artist Christian Nold (2004) has been using physiological methods to gather emotion data. With his project 'Bio Mapping', the artist aimed to visualise people's emotions related to and evoked by the environment. The mapping projects were conducted in over 25 cities, included more than 2000 participants and resulted in creating communal emotion maps, i.e. maps that comprise emotions of people (Nold, 2004). One of these projects was conducted by Nold (2007) in Stockport, United Kingdom. The project, which aimed to show the emotions, opinions and desires of locals, combined two activities: (1) drawing provocations and (2) emotion mapping. The first activity of drawing provocations included sketching the history, river, and landmarks of the town, and the daily lives of Stockport inhabitants. The emotion mapping entailed walking through the streets of Stockport equipped with a device (invented by Nold) which recorded the emotional arousal of participants in relation to their geographical location (Nold, 2007). The device, used in many of Nold's art projects, combines GSR measurement, which records the physical reaction of the body measured by the changes in the sweat level, and a Global Positioning System (GPS) receiver, which records the geographical position of participants (Nold, 2004). Recorded data was interpreted and annotated by the participants to give meanings to sensory stimuli which caused their emotional reactions (Figure 2.9) (Nold, 2007).

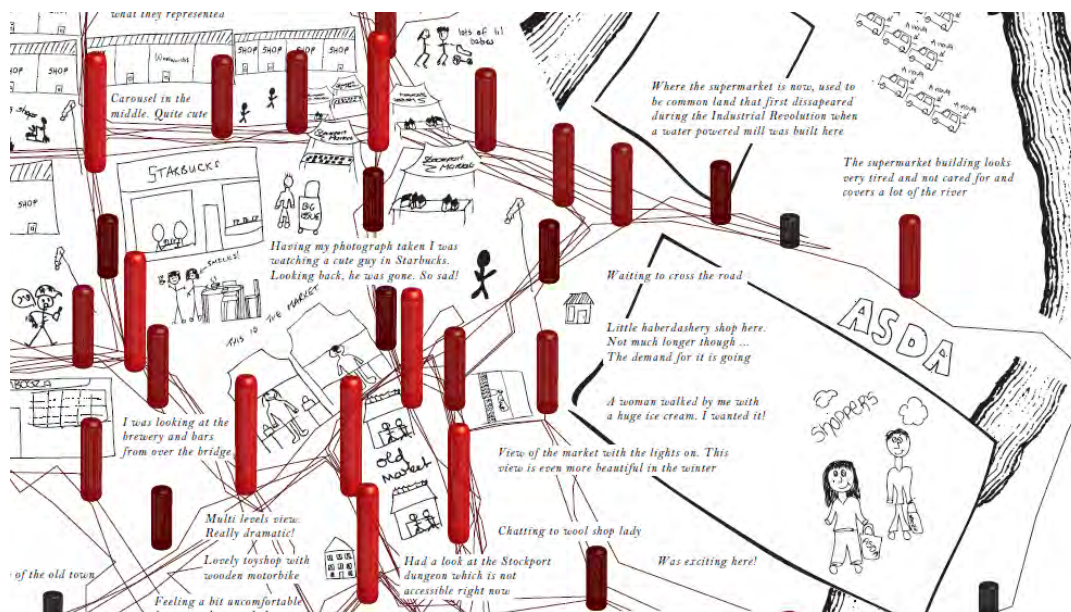


Figure 2.9: Extract from the 'Stockport Emotion Map'; the walks are represented by thin lines, emotional arousal by the pillars of varying height, textual annotations are added by the participants (Nold, 2007).

2.2.3 Emotions in maps

For a long time, cartography has largely focused on representing the visible and tangible (Griffin & Mcquoid, 2012; Wilson, 2011), or phenomena that can be mapped, such as air temperature, wind speed, etc. (Panek et al., 2017). Even though maps and the mapping process are full of emotions, the emotional component in cartography has become interesting only recently (Caquard & Griffin, 2018; Griffin & Mcquoid, 2012). However, cartographers have sought to relate perceptual and cognitive processes to mapping since the beginning of the 20th century (Griffin & Mcquoid, 2012). Additionally, critical and feminist cartographers have advocated mapping the space as experienced, including the emotional component (Pearce, 2008).

Already in the mid-20th century, there were attempts to collect emotions that were connected to places; since then more researchers have been interested in collecting emotional data (Caquard & Griffin, 2018). Improvements of measurement technologies have encouraged cartographers to map not only directly visible phenomena but also those that can be described and measured (Griffin & Mcquoid, 2012). The first published map of world happiness, 'A Global Projection of Subjective Well-Being' (Figure 2.10) was created by White; measurements of emotions were based on self-assessments of well-being. The choropleth map shows a level of happiness presented in a global projection (White, 2007). Recently, the affordability of technologies (e.g. GPS devices) has further encouraged the development of location-based projects and research (Nold, 2009).

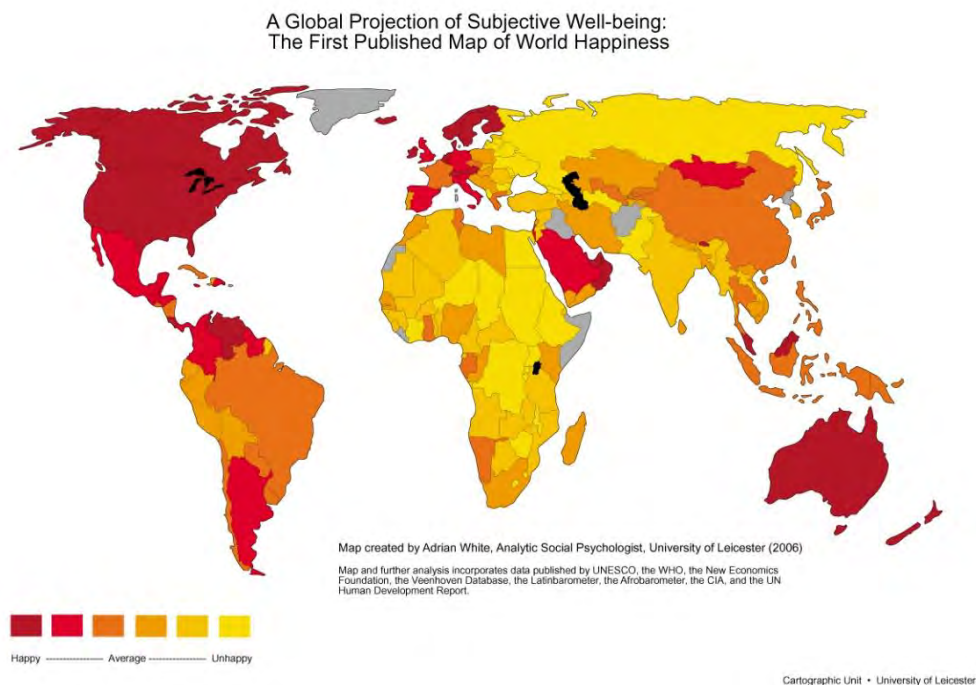


Figure 2.10: First published map of World Happiness (White, 2007).

There is no strictly defined standard for putting emotion maps into categories, however, below I discuss them in the following groups: (1) emotion maps derived from cognitive maps, (2) maps of emergent emotion, and (3) maps of emotions derived from social media, crowd-sourcing and smartphone technologies.

Emotion maps derived from cognitive maps

Social geographers have been using the cognitive mapping approach to map episodic emotions such as urban fear - the feeling to avoid certain areas of the city, fear of crime - marking unsafe places (Griffin & Mcquoid, 2012), and subjective data about the perception of safety (Panek et al., 2017). Alongside these collective avoidance maps showing the distribution of fear and crime and their spatiotemporal variability (Doran & Lees, 2005), some researchers were also interested in creating collective maps of inspiration depicting spaces of creativity (Figure 2.11). Gibson et al. studied areas where people felt inspired; they used GIS and other visualisation software to show non-numerical and invisible information and emotional connections of people to city spaces (Gibson et al., 2010).

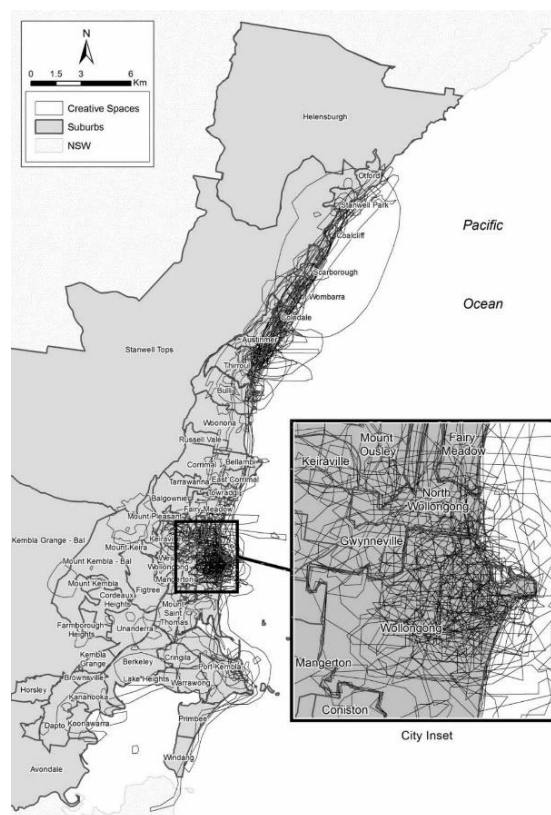


Figure 2.11: Combined drawing of 160 maps showing 'creative' Wollongong, Australia (Gibson et al., 2010).

Compared to the maps which show a set of recalled associations and emotions, some maps depict emergent emotions of respondents' as they occur (Caquard & Griffin, 2018). Nasar & Jones (1997) examined urban stressors such as fear and crime by conducting a study with female students. Respondents were asked to mark the routes they often use and later on report their feelings into a recorder while walking around darkly lit areas (Figure 2.12). Another example was created by Kwan (2007). She developed a collaborative 3D GIS videography, in other words, the moving images rendered from 3D GIS to create a video utilizing the first-person perspective. The fly-through animation was based on emotions a Muslim woman experienced at particular places in Columbus, Ohio, as she was driving through the city to undertake out-of-home activities shortly after the World Trade Center attacks on September 11, 2001, in New York (Kwan, 2007).

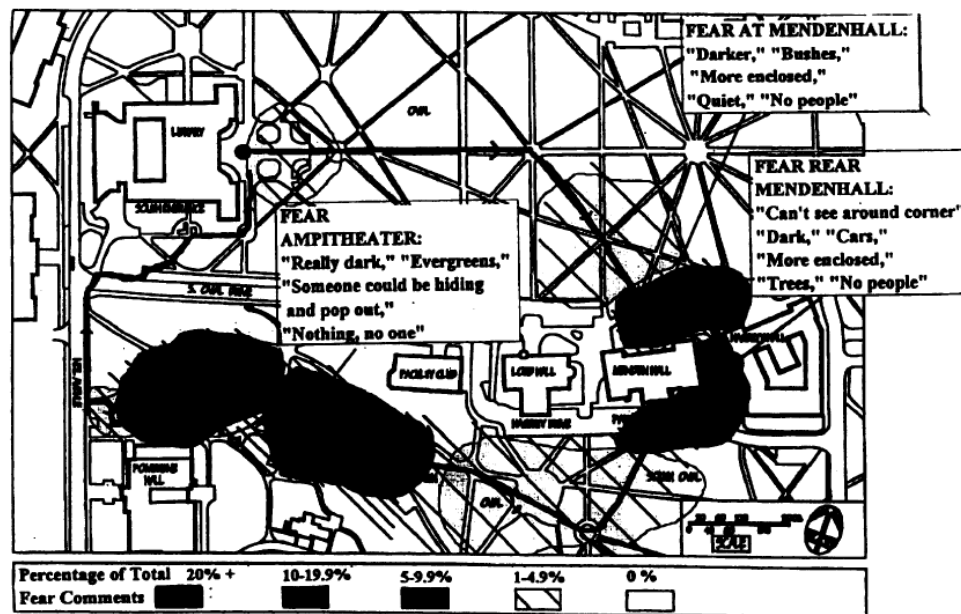


Figure 2.12: Map showing the spatial distribution of fear-related comments (Nasar & Jones, 1997).

Maps of emergent emotion

Cognitive mapping is influenced by the effects of interviewer, memory, conscious experience and feelings (Griffin & Mcquoid, 2012). To get more objective and measurable data about emotions, there are recent attempts of using physiological signs (such as sweat, heart rate, facial expressions) of arousal; different emotional states have their respective physiological signals (Lisetti & Nasoz, 2004), that can be measured with the help of wearable devices and later visualised onto the map.

Some authors focus on the emerged emotion rather than the emotion which can be recalled from a cognitive map (Griffin & Mcquoid, 2012). Emotions can be studied and visualised based on body reaction, using biometric technologies (Caquard & Griffin, 2018). In one such study, the artist Christian Nold (2009)

contributed to emotional cartography by using his 'Bio Mapping' approach to explore emotional responses in space. In his art project visualising bio data he combined recorded objective biometric data (measuring respondents' GSR) and geographic position (GPS measurement of respondents' geographical position) with participants' subjective story (respondents' interpretation of their emotion maps). The recorded emotional state of individuals at different locations was visualised as a composite emotion map, showing a collective emotional image of the area. One example of this kind of communal map is the 'San Francisco Emotion Map' (Figure 2.13), where 98 participants' tracks are annotated and overlaid and emotions are visualised as dots of varying colours (Nold, 2009).



Figure 2.13: Extract from the ‘San Francisco Emotion Map’ (Nold, 2009).

A similar approach is also used in the field of gaming, within the project “Ere be Dragons” (2006). The player is equipped with a portable device connected to a heart-rate monitor and GPS, which results in the graphical representation of the participant’s heart rate. The mapping process is simultaneous, i.e. takes place while walking, and the visual feedback represented on the device affects the behaviours of the user (Davis et al., 2006; Nold, 2009). In a further example, according to Griffin & McQuoid (2012), Hogerz used also a real-time method to understand the emotional experience evoked by the places in Lisbon, Portugal. Participants were wearing sensor wristbands with a GPS which were recording their galvanic skin response while walking. Respondents were also asked to document their emotional experience of the walk on a base map, which was later compared to the arousal maps (recorded emotional arousal) showing a high-level consistency to one another. In this manner, Hogerz obtained data about the locations of emotionally relevant places (Griffin & McQuoid, 2012).

Maps of emotions derived from social media, crowd-sourcing, and smartphone technologies

The internet ecosystem has significantly grown and led to the availability of digital user-generated data (Griffin & Mcquoid, 2012). Lately, social media has become a source of data about various topics, including emotions; expressions of emotions can be extracted from social media posts and visualised based on the research objectives (Caquard & Griffin, 2018). Access to this semantically rich data has opened new doors for researchers (Caquard & Griffin, 2018; Griffin & Mcquoid, 2012).

User-generated content can be extracted from Twitter data, which provides rich semantic data often including location (Griffin & Mcquoid, 2012). Mislove et al., (2010) used Twitter data to visualise the temporal mood variations throughout the day in the US. The authors generated a series of density-preserving cartograms showing the level of happiness on an hourly basis (Figure 2.14). Another example derived from Twitter data is an interactive map ‘Emography’ which displays six emotions in twelve cities; the map updates emotional state nearly in real-time, represents emotions with different colour hues and becomes interactive by showing the user an animation when data values vary to highlight the dynamic character of emotions (Griffin & Mcquoid, 2012).



Figure 2.14: Extracts from the ‘Pulse of Nation: the US Throughout the Day, as inferred from Twitter’; cartograms indicate the level of happiness at 7 am (left) and 7 pm (right) (Mislove et al., 2010).

In emotional cartography, alongside data from social media, other sources of internet data can also be used; An example is keyword searches in search engines that can be connected to names of places (Griffin & Mcquoid, 2012). Based on this approach, the artist Maurice Benayoun created a series of emotion maps – ‘World Emotional Mapping’ – where he focused on depicting some particular emotions (e.g. hopeful, satisfaction, etc.) or general mood in certain places (Benayoun, 2005; Griffin & Mcquoid, 2012). Another real-time example of emotion mapping is the ‘MIT Mood Meter’ (2011). This project aimed to estimate the overall mood of people around MIT’s campus by aggregating their smiles captured by cameras at different locations of the campus; the mood was visualised as a dynamic density surface map which shows the collective emotional state of the place (Griffin & Mcquoid, 2012).

The ubiquitous usage of smartphones has enabled researchers to capture respondents' current affective state caused by the surrounding environment; additionally, this data can be easily connected to geographical locations (Klettner & Gartner, 2012). Klettner & Gartner (2012) give examples of several location-based research projects - 'Mappiness'³, 'Track your happiness'⁴, 'CaptureEmo'⁵ - that were conducted using smartphones asking users about their emotional experience in spaces. However, this approach does not necessarily capture the emergent emotional state of a user because their self-reported affective experience can be influenced by the current environment in which respondents find themselves (Klettner & Gartner, 2012).

People perceive their environment, find patterns and interpret surroundings by assigning them affective qualities, which can be understood as properties; these properties are described by adjectives such as beautiful, exciting, hectic, etc. (Russell, 2003). Within the project, 'EmoMap', Klettner & Gartner (2012) developed a smartphone mapping app to collect affective responses evoked by the external world. The authors aimed to gather data that is free from non-spatial feelings, in other words, they focused on affective qualities, which are not as momentary as emergent emotions but present at any time (Figure 2.15). Affective data collected within 'EmoMap' depicts people's perception of space and therefore can be used as a basis for geospatial applications, such as navigation and wayfinding services for pedestrians that are better applicable to users (Klettner & Gartner, 2012).



Figure 2.15: Emotion maps of Vienna. In a different zoom level (left and centre aggregated content, right individual contributions); red dots indicate discomfort, dark green dots represent comfort (Klettner & Gartner, 2012).

³ Mappiness. <http://www.mappiness.org.uk/> (last accessed 08/2021)

⁴ Track your happiness. <https://www.trackyourhappiness.org/> (last accessed 08/2021)

⁵ CaptureEmo. <http://www.captureemo.com/> (last accessed 08/2021)

2.2.4 Conclusion

This section of related work has introduced emotions, their multifaceted nature and presence in the field of cartography. These complex constructs have been a study of interest for many disciplines; however, the cartographic research of emotion is relatively new. Additionally, emotions are challenging to record and visualise. Nevertheless, there are different approaches to collect affective responses of individuals via traditional methods (surveys and self-reports) or modern technologies (biometric measurements or emotion extraction from digital user-generated data). A considerable amount of research contributes to emotional cartography by studying and creating maps depicting remembered or momentary emotions. In addition, the development of the internet ecosystem and smartphone technologies have provided access to semantically rich emotional data derived from social media sources or obtained by the apps. Different approaches to collecting emotion data enable understanding the emotions that are related to and evoked by the surroundings and mapping the space as it is experienced.

3 Methodology

This methodology chapter introduces the research methods that are used within this thesis. A general overview of the used research designs and a detailed description of research methods (section 3.1.1) is followed by a subchapter giving insights about a case study site, as well as the study sample (section 3.1.1 and 3.1.2). Two main parts of this chapter give a comprehensive review of the first (section 3.2) and the second user (section 3.3) study settings. The research design of both user studies is further differentiated into constitutive parts within each section. The implementation of each part of the used methods is explained in detail and illustrated with visualisations and the materials which were used for the user studies. Subsequently, the last part of this chapter (section 3.4) gives information about the resulted data from both user studies and used methods of data interpretation.

3.1 Research design and research methods

Each research has its framework to collect and investigate data. These approaches of gathering and analysing data are known as research designs which entail different research methods, i.e. the techniques for collecting data (Bryman, 2012). It is important to choose a relevant research design and appropriate research methods for each study; however, research studies do not necessarily follow one specific research design, but often combine certain aspects and characteristics from multiple design types (Bryman, 2012).

3.1.1 Chosen research approach and methods adopted

The study of mental images of a place and the emotions attached to it requires developing an adequate research methodology. The research design guiding this thesis is a mixed design that combines characteristics of multiple research design types such as (1) case study design (focuses on a comprehensive and intensive examination of a specific case), (2) longitudinal design (namely cohort study type, where the same sample is surveyed more than once), (3) comparative design (uses similar methods to compare and examine two or more contrasting cases), and (4) cross-sectional design (also known as survey design using questionnaires and interviews) (Bryman, 2012). The distinction between these design forms is not always clear, as they overlap each other and often use the same or very similar research methods. A combination of the above-mentioned research designs defines the methods used for this study, as well as intended results.

To meet the research objectives of the thesis and answer the research questions (see section 1.2) the study design was divided into two major parts: the first and the second user studies focused on mental images created by the participants and their emotions attached to places, before and after living at the site of study. Both user studies have a similar research framework and accordingly use similar research instruments. For the chosen research approach, data was collected by using the following research methods: (1) questionnaire, (2) case study activity ('Vienna city walk'), (3) mental mapping, and (4) interview.

Questionnaire

In this study, several sets of questionnaires, both digital and paper-based, were used. Questions were open- and closed-ended (multiple-choice) to collect data from the respondents about their associations, opinions, experiences, and emotions. Questions also included rating scales, which allow graded responses to be quantified.

Case study activity

Both user studies of this thesis researched the mental images of and the emotions attached to a place in the case of Vienna, Austria, with the same cohort of participants. These case studies were conducted twice in different settings (online and on-site) and at different times. They included different parts, among which the 'Vienna city walk', a walk through the city introducing participants significant landmarks of the city, had one of the central roles. Both user studies had a similar framework, which enabled a comparison of the results obtained from each case study.

Mental mapping

Mental mapping is one of the key methods used in this research to illustrate the perception of a place through mapping. The mental mapping activity included drawing a mental image of the study site, Vienna. This technique did not aim to capture the experience in real-time but to depict images of Vienna as perceived, remembered, and expressed by the individuals.

Interview

The last method used in this research is a semi-structured individual interview. A semi-structured interview is a mix of structured (following a pre-defined sequence of questions) and unstructured (questioning process has a more spontaneous nature) interviews (Bryman, 2012). Thus, in this study, semi-structured interviews mainly followed pre-defined open- and closed-ended questions in the script, but at the same time, certain questions had a more free and explorative character. Using interviews helped to collect information that could not be directly measured. Furthermore, interviews were essential to interpret the meanings given to mental maps drawn by the participants, as well as to collect emotional data.

3.1.2 Case study selection

Case study site

In this thesis, Vienna, Austria, was chosen as a site for the case studies. Vienna has a highly imageable character due to its memorable urban and natural features, and pleasing scenes. Various urban details such as recognisable landmarks, natural amenities, open recreational spaces, and city infrastructure all combine to create an urban iconography of Vienna.

In the user studies, the main focus was made on the area around the city centre of Vienna, which reflects the vivid identity of the city and is characterised by a diverse spectrum of significant urban landmarks. This part of the city is often visited by its inhabitants and visitors. It has qualities of recognisability and accordingly is easy to symbolise. For the ‘Vienna city walk’, a part of both user studies, 17 landmarks were selected (Table 3.1) based on their perceptual, as well as historical and cultural importance. While choosing these points of interest their location was also taken into account. Distinguishing these 17 landmarks was based on an assumption that their symbolic and functional importance could shape a strong, well-identifiable image which could later be reflected into the mental maps of participants enriched with remembered experiences and emotional attachments to those places.

N	Landmarks
1	TU Wien
2	Karlskirche
3	Musikverein
4	Staatoper
5	Kunsthistorisches Museum
6	Museumsquartier Wien
7	Naturhistorisches Museum
8	Volkspark
9	Rathaus
10	Burgtheater
11	Hofburg
12	Albertina
13	Stephansdom
14	Donaukanal
15	Urania
16	Stadtpark
17	Belvedere

Table 3.1: Landmarks of user studies.

Case study participants

Participants of both user studies were students from the same cohort of the international Master Program of Cartography⁶. This specific sample of international students had the best fit to the required criteria and met the main objectives of the thesis – analysing mental maps drawn by the participants and their emotions before visiting and after exploring and living in that place. While conducting the first user study, students were not living within the study site – Vienna (importantly, most of them had never been to the city). Whereas the second user study was carried out when the same sample of students had already been living in Vienna for over three months. The sample, though small and homogenous (in terms of their occupation) is diverse taking into account the different personalities and cultural backgrounds of students providing valuable insights into this research.

In the following chapters of the thesis, the words *participants*, *students* and *respondents* will be interchangeably used and they will refer to this specific cohort of participants of both user studies. Furthermore, the term *full participants* (24 students) will refer to those who participated in both user studies and submitted the mental maps for each. By contrast, *single participants* (4 students) will refer to those, who participated in either the first or second user study and therefore submitted only one mental map. The term *interviewer* will be used to refer to me as a researcher.

3.2 The first user study

The thesis aims to study the mental maps created by participants before and after living in the study cite – Vienna. Therefore, the first user study was conducted before the students' cohort moved to Vienna. This part of the study was completed via a video conference software Zoom⁷, with 28 (24 full and four single participants) international students. It consisted of 6 parts (Figure 3.1), including two sets of questionnaires that were conducted using Mentimeter⁸, an interactive presentation and survey software. Likewise, two sessions of the PANAS mood scale tests were carried out using a poll within the Zoom. Between these parts, a virtual 'Vienna city walk', a narrated presentation with PowerPoint slides, was shown to students. Finally, the participants underwent a mental mapping activity. The whole process took 45 minutes in total. Below a detailed structure of the first user study is given.

⁶ Cartography M.Sc. <https://cartographymaster.eu/> (last accessed 08/2021)

⁷ Zoom. <https://zoom.us/> (last accessed 08/2021)

⁸ Mentimeter. <https://www.mentimeter.com/> (last accessed 08/2021)



Figure 3.1: Structure of the first user study before visiting the place (online).

Part 1: Mentimeter – questionnaire

At the beginning of the first user study, participants were asked to respond to two questions via interactive survey software – Mentimeter. The questions (Table 3.2) resulted in quantitative and qualitative answers.

Question	Question type	Resulted data type
Q1 Have you ever visited the city of Vienna?	multiple-choice	quantitative
Q2 Please type up to three keywords for the city of Vienna representing your ‘image’ of the city. What do you associate with Vienna?	open-ended	qualitative

Table 3.2: The first user study; questionnaire (Part 1).

Part 2: The PANAS – mood scale

The PANAS is a mood scale that includes a positive and negative affect schedule and consists of 20 words that describe different feelings and emotions (Watson et al., 1988) (see section 2.2.2). Respondents were asked to assign given words a number from 1 to 5 to indicate the extent of their feelings and emotions at the present moment (Figure 3.2).

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely
___ Interested				___ Irritable
___ Distressed				___ Alert
___ Excited				___ Ashamed
___ Upset				___ Inspired
___ Strong				___ Nervous
___ Guilty				___ Determined
___ Scared				___ Attentive
___ Hostile				___ Jittery
___ Enthusiastic				___ Active
___ Proud				___ Afraid

Figure 3.2: The PANAS mood scale (Watson et al., 1988).

Part 3: ‘Vienna city walk’ – presentation

After responding to the Mentimeter and the PANAS questionnaires, participants were given a presentation (with PowerPoint slides) in the form of a virtual tour following the predefined route around the city centre of Vienna. It included the before mentioned 17 significant urban landmarks. For each landmark, short narrated information, as well as media, such as photos (for 15 landmarks), videos (for two landmarks), and texts (for five landmarks), were provided. The presentation also included the entire map of the walk (Figure 3.3) (shown at the beginning and the end of the presentation), as well as its particular sections (three map sections) (see Appendix A.1 for the entire presentation).



Figure 3.3: Map of the 'Vienna city walk' depicting the entire route and the landmarks.

Part 4: The PANAS – mood scale

Following the presentation, participants were asked to fill out the PANAS mood scale again. Using the same scale, a second time checked the change in the students' emotions after the virtual 'Vienna city walk'.

Part 5: Mental mapping

The virtual 'Vienna city walk' and second round of the PANAS were followed by the mental mapping activity. Participants were asked to draw their mental maps of Vienna (they were not informed in advance about it). They were free in choosing colour(s). At the end of the mapping activity, the interviewer instructed students to take photos or scan their drawings and send them via email (see Appendix A.2 for the first set of mental maps).

Part 6: Mentimeter – questionnaire

The first user study was concluded with another Mentimeter questionnaire. Respondents were asked three questions (Table 3.3) to get qualitative as well as quantitative insights about the mapping process and their attitude towards Vienna.

Question	Question type	Resulted data type
Q3 What did you enjoy the most while creating a Mental map?	open-ended	qualitative
Q4 What was for you the hardest part of creating a Mental map?	open-ended	qualitative
Q5 After creating the Mental map <ul style="list-style-type: none"> - Vienna became more familiar to me - I have a clearer image of Vienna - I am looking forward to checking my mental image of Vienna - I am more curious to explore Vienna - Nothing has significantly changed 	multiple choice	quantitative

Table 3.3: The first user study; questionnaire (Part 6).

As a result of the first user study, 24 maps were collected, as were quantitative and qualitative data from the above-mentioned questionnaires. The presentation of the virtual ‘Vienna city walk’ and resulting mental maps can be seen in Appendix A.

3.3 The second user study

To better understand how the perception of Vienna and its mental images changed over time, a second user study took place on-site, after the students had moved to and been living in Vienna for over three months. The second user study had a similar general setting (Figure 3.4) to the first user study. It included seven parts: two sets of questionnaires, two sets of PANAS mood scale tests, the ‘Vienna city walk’ (an on-site tour), the mental mapping activity, and, additionally, individual interviews with the respondents. The participants were the same international students (24 full and two single participants) as in the first user study.

The main difference between the two user studies was that the second user study was conducted on-site, face-to-face. Another variation between the studies was the number of landmarks included during the ‘Vienna city walk’. The initial route included 17 landmarks (Table 3.1) covered in the first user study in the online presentation. However, it was not possible to visit all of them while walking. Therefore, the initial route was modified for two reasons: (1) the length of the route (9km, 3h), and (2) time (overall user study length would increase up to 4hours, without the last part of interviews). These aspects could cause the participants to not attend. As a solution, the whole walk was split into three thematic routes, with 5 to 7 landmarks. This modification of the ‘Vienna city walk’, allowed all landmarks that were covered during the first user study, as well as all participants, who were more likely and eager to join the walk of moderate length to still be included.

The first six parts of the study (all except for Part 7 – Interviews), which were corresponding consisting parts of the first user study, were held in small groups of students (around four students per group). Participant grouping was random. They were free to choose the time and group via an online platform – Datumprikker⁹, as well as time slots for individual interview sessions. Below each part of the second user study is discussed in detail.

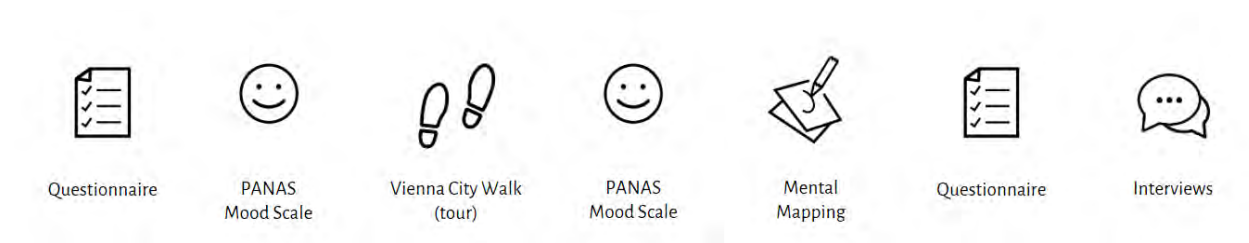


Figure 3.4: Structure of the second user study after exploring and living in that place (on-site).

Part 1: Questionnaire

After meeting a group of students, giving an overview of the following steps and getting the participation consent, respondents were asked to complete a small questionnaire (Table 3.4). The questionnaire included four open-ended questions to reveal students' associations towards Vienna and its landmarks, including the places they favour and find important in the city (see Appendix B.3).

Question	Question type	Resulted data type
Q1 Please give three keywords that represent your 'image' of the city of Vienna. What do you associate with Vienna?	open-ended	qualitative
Q2 What landmarks do you associate with Vienna	open-ended	qualitative
Q3 My favourite places in Vienna are	open-ended	quantitative
Q4 Name a place in Vienna that is important to you. Why is it important to you?	open-ended	quantitative

Table 3.4: The second user study; questionnaire (Part 1).

⁹ Datumprikker. <https://datumprikker.nl/events> (last accessed 08/2021)

Part 2: The PANAS – mood scale

The questionnaire was followed by the first PANAS mood scale test. The participants were asked to rate given words on a scale from 1 to 5 to indicate the extent of their feelings and emotions at the present moment.

Part 3: ‘Vienna city walk’ – tour

Completing the questionnaires was followed by the ‘Vienna city walk’. The initial route was divided into three thematic walks (a, b, c), including five to seven landmarks (Figure 3.5). Each walk had little overlaps (1-2 landmarks). The length of the walks was in the range of 2.5 to 4km, and the time to cover them, from 50min to 1h 10 min. More detailed information about each walk can be seen in Table 3.5.

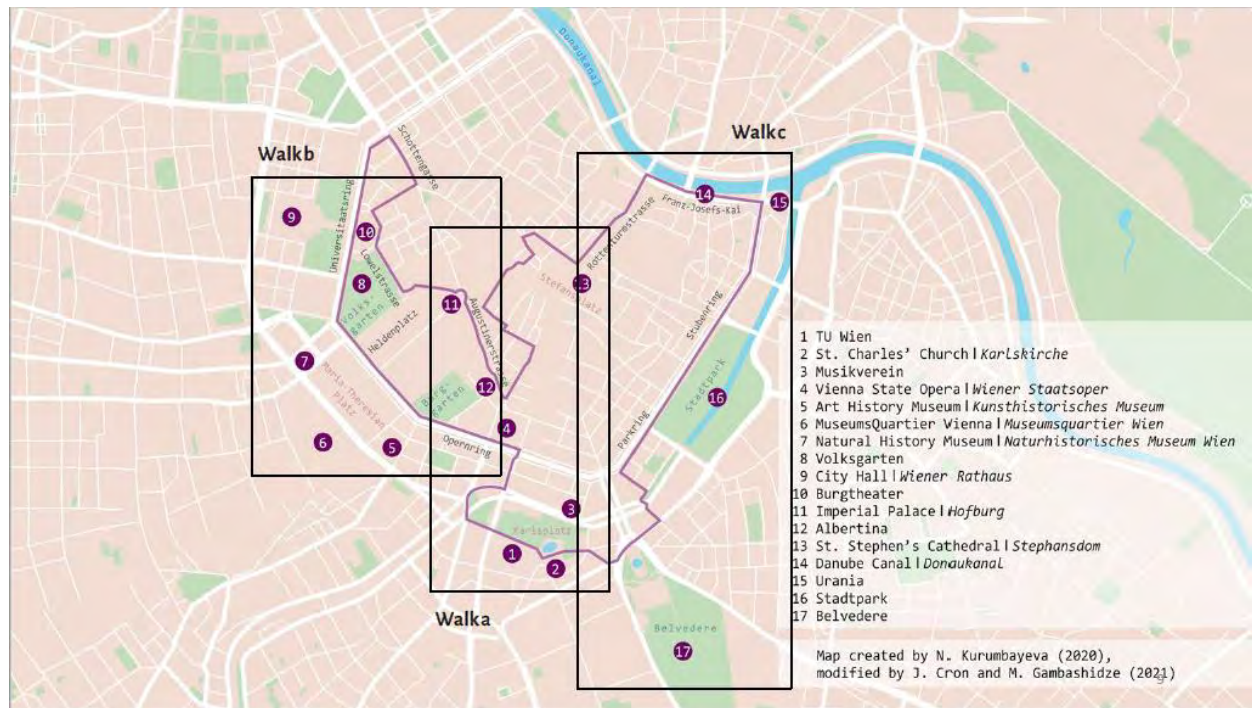


Figure 3.5: The second user study; thematic routs of ‘Vienna city walk’.

During the walk, participants were guided through the streets of Vienna and were told some facts, interesting stories, and personal memories about the landmarks and places (see Appendix B.5). Students were not equipped with any maps or devices. The time between reaching each destination was used to evoke students’ impressions about Vienna by casual chats between the interviewer and students, as well as among the students. During the walk, some notes were taken by the interviewer about possible influencing factors such as weather conditions, distractions, alterations to the intended route or script, the general mood of the group, and other comments (see Appendix B.6).

‘Vienna city walk’	Distance & Time	Landmarks (N & name)
Walk a	3km, 1h	7: TUW, Karlskirche, Musikverein, Staatsoper, Albertina, Hofburg, Stephansdom
Walk b	2.5km, 50min	7: Albertina, Kunsthistorisches Museum, Naturhistorisches Museum, Museumsquartier, Rathaus, Burgtheater, Volksgarten
Walk c	4km, 1h 10min	5: Stephansdom, Donaukanal, Urania, Stadtpark, Belvedere

Table 3.5: The second user study; details of the ‘Vienna city walk(s)’.

Part 4: The PANAS – mood scale

Following the ‘Vienna city walk’, students were asked to complete the PANAS mood scale test a second time. Repetition of the test allowed to track changes of respondents’ emotions after the walk.

Part 5: Mental mapping

After guiding the students through the landmarks, places, facts, and personal stories related to the selected points of interest of Vienna, they were asked to draw their mental maps of the city. Participants were free to enrich mental images with any landmarks, stories, emotions, etc. They were provided with A4 sheets of paper, twelve coloured pencils and were given twenty minutes to complete the mapping task (see Appendix B.9 for the second set of mental maps).

Part 6: Questionnaire

The second user study was concluded by the final questionnaire (see Appendix B.10). With open- and closed-ended questions it mainly aimed to find out influencing factors of students’ mental images and emotions towards places, as well as reveal the most enjoyable and difficult parts of the mental mapping. All steps (Parts 1 – 6) of the second user study took around 2 hours in total.

Question	Question type	Resulted data type
<p>Q5 After the ‘Vienna city walk’ and creating a mental map</p> <ul style="list-style-type: none"> - I have learnt something new about the city - I am more curious to further explore the city - I feel a greater connection to the city - Nothing has significantly changed 	yes/no/do not know	quantitative

Table 3.6: The second user study; example from the questionnaire (Part 6).

Part 7: Interviews

Interviews were carried out individually with each participant. The main aim of this part was to give meaning to the mental images and get deeper insights into respondents’ emotions related to places. Interviews were semi-structured with open- and closed-ended questions and were divided into the following sections: (1) general, (2) meanings and visual language, (3) similarities and differences, (4) memorability of places, and (5) emotions (see Appendix B.11). Most questions were the same for both mental maps (created during the first and second user studies) which were presented to participants during the interview sessions. Each interview took around 45 minutes and was recorded for the transcription and further analysis.

3.4 Data analysis and interpretation

The data collected in the first and second user studies is diverse by its nature. The nature of data were mental maps (qualitative), questionnaires (qualitative and quantitative), and interviews (qualitative). A digital survey tool was employed for questionnaires in the first user study, whereas the second user study was entirely paper-based. Therefore, the first step was digitising all obtained data. Mental maps were scanned, while the questionnaire and interview data was transferred to excel format. Then, the data was structured, categorised, and quantified. As the data was majorly qualitative and the sample quite small (24 respondents), mainly frequencies and proportions were used from statistical analysis to identify the trends and findings.

Mental maps were broken down into consisting parts and turned into a tabular format (excel table). Based on visual analysis, each of the map elements was registered as a separate record described by different attributes which were given under the corresponding columns (*author, id, map number, feature name, category, type, relevance, visualisation type, colour, type of mental map, and walk id*). These attributes were derived from the analysis of mental maps, questionnaires, and interviews. The final table representing 48 mental maps with 1170 records was later processed based on the needs and interests of the study. In addition to mental maps,

interviews were one of the primary sources of data. Each of them was transcribed, filtered, and the outcome data was analysed semantically. Text interpretation and grouping of responses of open-ended questions were followed by categorisation and later quantification of the results. Questionnaires were likewise processed. Closed-ended questions were directly quantified, whereas semantic analysis, categorisation, and later quantification was employed for the open-ended questions.

3.5 Conclusion

This methodology chapter has described the chosen research design and methods. The overall research framework of this study is a mixed design as it includes elements from different design types. To meet the study objectives, different research instruments were used, such as questionnaires, case studies, mental mapping, and interviews. The main part of the action in this thesis is conducting two separate user studies. Both studies aimed to find out the role of associations, existing knowledge, influencing factors, and personal experiences in forming of mental images of and emotional attachments to places. The first and the second user studies were employed with slightly different settings and at different times. The former one was online, whereas the latter one was conducted after three months, on-site. The case study site, Vienna, and the participants, a cohort of students, were the same in each user study. The outcome of the user studies combines mental maps with other qualitative and quantitative data. Data analysis and interpretation methods are as diverse as the data itself. Above all, the systematic and standardised approach of both user studies make them and their outcomes comparable.

4 Results and discussion

This chapter describes and discusses the findings of the mental maps and related emotions before visiting and after living in Vienna, obtained from the first and second user studies, respectively. The presented outcomes are derived from the qualitative and quantitative analysis of mental maps, questionnaires, and interviews. The chapter follows the structure of the research objectives and corresponding research questions discussed in section 1.2. Therefore, this chapter begins with illustrating and explaining the outcomes of the first user study (section 4.1), then presenting and interpreting the results of the second user study (section 4.2). In the end, it gives insights into the mental image of the city (section 4.3), including a comprehensive discussion of the landmarks and places of personal relevance (section 4.3.1), emotions that accompany the mental mapping process (section 4.3.2), and similarities and differences between the emotions and mental images drawn before and after living in Vienna (section 4.3.3). Consequently, each of these three main parts of the result and discussion chapter is summarised in the sections of corresponding conclusions, which brings the main findings together.

4.1 Mental maps and emotions before visiting the place

4.1.1 Primary associations related to Vienna

Existing associations towards Vienna were examined in the first user study. The question was formulated as such: ‘Please type up to three keywords for the city of Vienna representing your ‘image’ of the city. What do you associate with Vienna?’ This allowed the survey to identify the associations which students held towards Vienna before visiting the city. Asking the question at the beginning of the user study enabled collecting the associations which were not affected by the ‘Vienna city walk’, i.e. by the information which was given during the online presentation. In total, 28 participants provided answers and gave 81 words that they associated with Vienna (Figure 4.1). Thirteen associated words were used more than once: *Beautiful* and *Music* (seven times), followed by *Museums* (four times), *Donau*, *Schnitzel* and *Historical* (three times), *Oper*, *Prater*, *Old*, *Fancy*, *Beautiful buildings*, *Sachertorte*, *Coffee houses* (two times).



Figure 4.1: Word cloud showing the primary associations related to Vienna.

Looking at the semantics of associative words show that *adjectives* are in the majority (42% of all words), whereas the rest of the words can be grouped into the following categories: *art & culture* (32%), *landmarks & buildings* (6%), *river & surroundings* (4%), *parks & nature* (2%), *urban environment* (2%), and *other* (11%) (Figure 4.2). *Other* includes the words which could not be classified in any of the aforementioned categories; examples of such words are names of famous people (*Mozart*, *Strauss*, *Sisi*) or the facts with historical meanings (*Habsburgs*, *Treaty of Vienna*, *Vienna convention*, etc.). Looking more into detail at the nature of adjectives, they often describe either the appearance or visual qualities of Vienna: *Beautiful*, *Fancy*, *Elegant*, *Nice*, *Luxury*, *Majestic*, *Clean*, *Illuminated* or its character: *Friendly*, *Historical*, *Imperial*, *Lively*, *Old*, *Vibrant*, *Hip*, *Open-minded*, *Classical*. Nearly all words have positive connotations, except for the adjective *crowded*. The second leading category of the associations given by respondents before visiting Vienna includes the words associated with *art & culture*, in which music and art-related words (*music*, *opera*, *orchestra*, *museums*, *art*, *waltz*) are followed by the gastronomic words (such as *Coffee houses*, *Schnitzel*, *Sachertorte*). The following category of *landmarks & buildings* includes five very generic words (such as *architecture*, *beautiful buildings*, and *palace*) and only one concrete name of a landmark - *Stephansdom*. Categories of *river & surroundings* and *parks & nature* each comprise only one word, *Donau* (three times) and *Prater* (two times), respectively. Finally, the category *urban environment*, includes only one concrete place name - *Stephansplatz*.

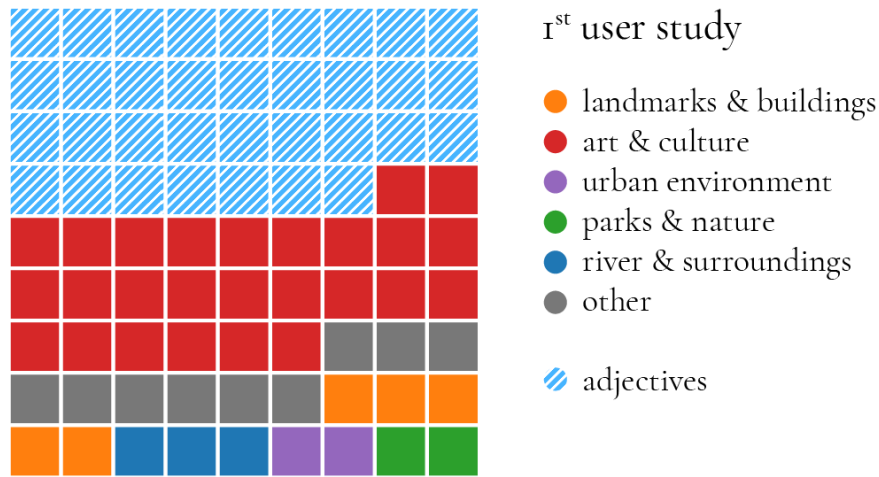


Figure 4.2: Primary associations related to Vienna by category.

Before the first user study, nine participants had already been to Vienna. Tracking the associative words of those who had already been to Vienna, on the one hand, and who had never been there before, on the other, reveals that the associated words which have a more specific character (for example *Stephansplatz*, *Prater*, *Train*, *Sisi*, and *Strauss*) are from the former group of students; whereas more generic words (*Architecture*, *Beautiful buildings*, *Palace*) from the latter, as their associations were not directly based on personal experiences.

As illustrated, the associations related to Vienna are quite diverse. Nearly half of them are adjectives describing the character of the city. The associated words related to places, i.e. excluding the adjectives, are mainly quite generic without the specific place and landmark names. This trend is fairly natural, as the associations towards places that are not experienced yet are often shaped by general expressions, rather than the cognitive experience, i.e. attained through research, and/or memories, i.e. from first-hand experience, related to specific place names. These expressions and associated words show either the expectations and feelings of respondents or reflect socially widespread opinions.

4.1.2 Impact of the virtual ‘Vienna city walk’

One of the core parts of the first user study was based on the virtual ‘Vienna city walk’, given in the form of PowerPoint slides (see Appendix A.1). The presentation aimed to provide short pieces of information about the 17 urban landmarks and places of Vienna, which were chosen for the case study. The information was communicated in different ways, such as narration, images (for 15 landmarks), videos (for two landmarks), texts (for five landmarks), the map of the entire walk (presented at the beginning and the end of the virtual walk), and its particular sections (three times).

To find out, on the one hand, the influence of *virtual 'Vienna city walk'* (including different media) and, on the other hand, respondents' *prior knowledge, associations, and/or impressions of Vienna* on the **mental image** of and **emotions** towards Vienna, students were asked to evaluate the statements, on a Likert scale from 1 (*very influential*) to 5 (*not influential*). The answers were collected from 24 participants.

Influence of the cognitive experiences, associations, and the virtual 'Vienna city walk'

Based on the results, the *virtual 'Vienna city walk'* significantly influenced the mental images of 58% of respondents, where 37% rated this factor as 1 (*very influential*) and 21% as 2 (*influential*). The respondents who were of the opinion that their *prior knowledge, associations, and/or impressions of Vienna* were *very influential* (1) and *influential* (2), 21% and 25% respectively, consisted of 46% in total. In general, the responses showing the impact of *prior knowledge, associations, and/or impressions of Vienna* on the mental image were quite evenly distributed, especially between answers 1 (with 21%), 2, 3, and 4 (25% each) (Figure 4.3). Emotions of respondents towards places have also been affected by their *prior knowledge, associations, and/or impressions of Vienna* and the *virtual 'Vienna city walk'*. The results showing the intensity of the influential factors were quite unevenly distributed. More than half of the students (67%) still chose the *virtual 'Vienna city walk'* as influential, among them, 17% stated it as *very influential* (1) and 50% as *influential* (2). On the other hand, 21% of students evaluated the *virtual 'Vienna city walk'* as *not influential* (5). For the statement, if the *prior knowledge, associations, and/or impressions of Vienna* had an impact on the emotions of students, the majority (33%) chose a *neutral* (3) answer or leaned towards *less influential* (4) - 29% of the respondents.

The first influential factor, *prior knowledge, associations, and/or impressions of Vienna*, shows similarities especially in the two most extreme answers that are *very influential* (1) and *not influential* (5). The same proportion of students (21%) mentioned that this factor was *very influential* (1) for both - as for their mental image as well as for their emotions towards Vienna. Additionally, also the same portion of students (4%) stated that this factor was *not influential* (5) neither for their mental images nor for emotions. In the middle range of the answers, there are some variations between the responses; however, they still show quite a stable trend.

The second influential factor, the *virtual 'Vienna city walk'*, has a different dynamic. The ratings (from 1 to 5) are spread quite unevenly. In total, over half of the respondents stated that the *virtual 'Vienna city walk'* was influential for their mental images as well as for emotions. Looking at the two most extreme answers and taking into account the prior experiences of the respondents give interesting and valuable insights. Approximately 38% (nine students) of the 24 respondents had already been to Vienna (most of them for a short term visit). From the students who stated that their *prior knowledge, associations, and/or impressions of Vienna* were *very influential* (1) for their mental images as well as for emotions, 60% had already been to Vienna. Additionally, the majority of the respondents, who indicated that the *virtual 'Vienna city walk'* was *not influential* (5) either for their mental images of (67%) or for their emotions towards (80%) Vienna, had also already been to the city.

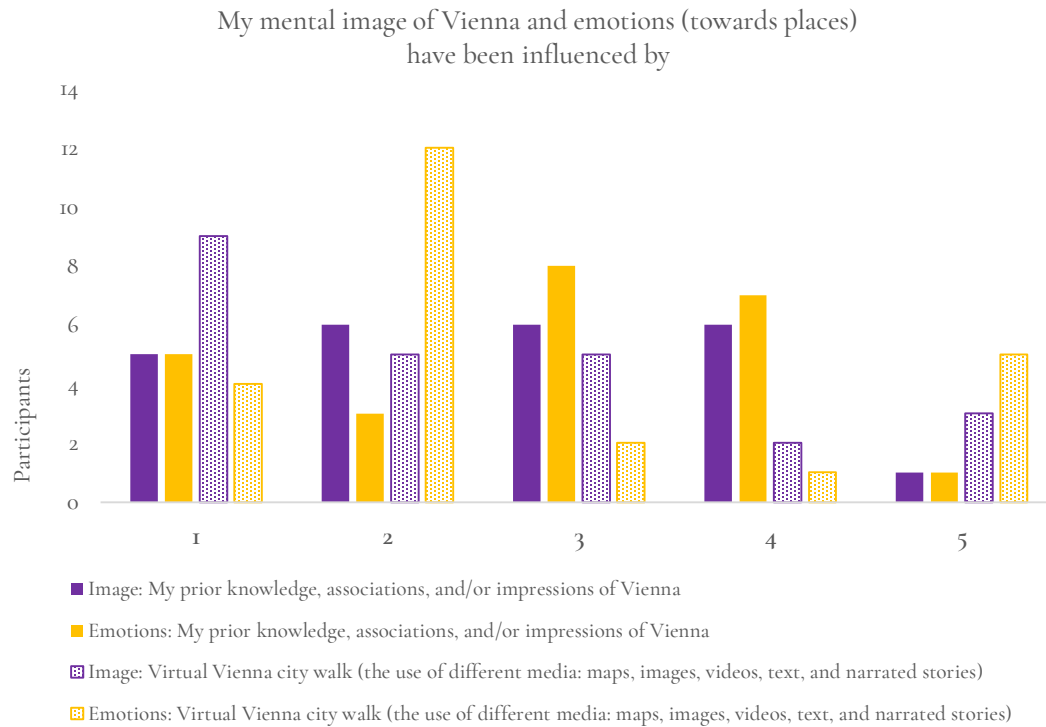


Figure 4.3: Influence of the two different factors on the first mental images and emotions.

Another interesting trend is that 33% of participants indicated a *neutral* (3) answer while rating the statement that *prior knowledge, associations and/or impressions of Vienna* had influenced their emotions towards places. It shows that evaluating the connection between the prior experiences and emotions is challenging, whereas ranking emotions that were triggered by the *virtual ‘Vienna city walk’* was easier; only 4% of respondents chose the *neutral* (3) answer for this statement.

To conclude, evaluating the influential power of *prior knowledge, associations, and/or impressions of Vienna* is challenging, especially its relationship with emotions towards places. The prior knowledge, associations and impressions are not as one-time experiences as the virtual ‘Vienna city walk’. They accumulate over time and can be unconscious. Therefore, the assessment of the above-mentioned statements was difficult for the participants. However, the prior knowledge, associations and impressions which people hold towards places affect the mental images and emotions in a quite similar way. It plays an influential role especially if it is based on personal experiences such as visiting a place. These kinds of mental images are well established and cannot be easily affected or altered by giving new information with different means of media.

Influence of the used media

During the interview sessions, students were asked to indicate which media, used in the virtual ‘Vienna city walk’ presentation, was the most influential both for their mental images and for their emotions. Respondents were free to choose more than one answer from the given list: *maps*, *images*, *videos*, *text*, and *narrated stories*. In total 27 answers were collected. Regarding mental images, none of the participants thought that *texts*, which were provided on the slides along with the landmarks, were influential. Visual media such as *images* (37%) and *videos* (26%) revealed the most influential character, followed by *narrated stories* (22%), and *maps* (15%) (Figure 4.4).

While evaluating the impact of the *virtual ‘Vienna city walk’* on the emotions towards places, students were also asked to select the most influential media used in the virtual ‘Vienna city walk’. Here as well, respondents could choose more than one answer from the provided five options (*maps*, *images*, *videos*, *text*, and *narrated stories*). In total, 26 responses were collected, which were distributed into three groups. *Maps* and *text* were not mentioned as influential media by any respondent. In the triggering of emotions, *videos* and *narrated stories* took the leading position (39% each), followed by *images* (22%).

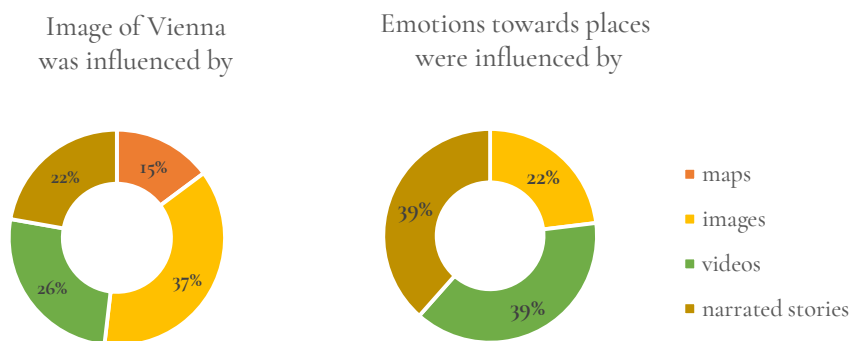


Figure 4.4: Influence of media used in the virtual ‘Vienna city walk’ on mental images and emotions.

Comparing the influence of media used in the virtual ‘Vienna city walk’ on mental images with its influence on the emotions related to Vienna, there is one clear trend that *text* plays no role in either of them, i.e. it affected neither the mental images nor the emotions of participants. On the other hand, visual media, such as *videos* and *images* have a strong influential power. In terms of the mental image, pictures were more influential, whereas emotions were largely triggered by *videos*; even though the event included only two *videos* but 15 *images*. The influential power of *maps* played a role only for the mental images but not for the emotions. This can be explained by the fact, that *maps*, even when depicting unknown places, give visual guidance which can help a person to form his or her mental image. However, the *maps* which are neutral in their nature and not persuasive do not trigger emotions and cannot compete with other visual media such as *images* and *videos*. An interesting outcome is the big proportion of *narrated stories* which was picked as one of the most influential categories in terms of emotions. In narration, the same message can be expressed and perceived differently. As

a result, it can have quite a strong subjective nature which is crucial in terms of evoking emotions. The person who narrates can significantly trigger emotions. To measure this aspect and check the hypothesis, it would be interesting to conduct a similar study in the future, where narrators would be different.

Depicted elements in the first mental maps

After the virtual ‘Vienna city walk’, students were asked to draw their mental images of Vienna. During the presentation, 17 landmarks of Vienna were covered. From these landmarks, 13 (82%) were depicted by the participants. Excluding those participants who had already been to Vienna did not change the number of drawn elements. This high number shows that the virtual ‘Vienna city walk’ has largely influenced the mental image that participants were holding. The landmarks which were introduced in videos, *Albertina* & *Oper*, were depicted on mental maps by 17% and 34% of the students, respectively. However, these were not the landmarks with the highest frequency. *TUW* (58%), *Donaukanal* (54%), *Stephansdom* (34%) were the three most often drawn elements that had been included in the virtual ‘Vienna city walk’. The high portion of *TUW* can be explained not necessarily by its visual properties but by the contextual. *TUW* gained importance for students, and it became one of the most often depicted elements of their mental images, as all respondents were going to move to Vienna for academic reasons. In terms of frequency, *TUW* was followed by the *Donaukanal*. It can be interpreted by the highly memorable character of water bodies in urban areas. This argument is supported by the fact that the most often included element in the mental maps was *Donau* (75%) even though the river was not presented during the virtual ‘Vienna city walk’.

Landmark	Frequency
TUW	14
Donaukanal	13
Oper	8
Stephansdom	8
Karlskirche	5
Albertina	4
Hofburg	4
Museumsquartier	4
Naturhistorisches Museum	3
Rathaus	3
Kunsthistorisches Museum	2
Musikverein	1
Volksgarten	1

Table 4.1: ‘Vienna city walk’ landmarks depicted in the first mental maps.

The following landmark, *Stephansdom*, is frequently mentioned because of its visual properties and iconic character. *Karlskirche* (21%) also received a fairly high share in the frequency ranking due to its visual appeal and memorable shape. Furthermore, its location plays an important role as *Karlskirche* is located in the vicinity of the university - *TUW*. The landmarks which were not included in any of the mental maps were the following: *Burgtheater*, *Urania*, *Stadtpark*, and *Belvedere*. The respondents might have omitted those points of interest as they had already included the features with similar properties such as buildings of performing arts (*Oper*, *Musikverein*), a park (*Volksgarten*), and a palace (*Hofburg*). Moreover, 75% of the left out landmarks (*Urania*, *Stadtpark*, and *Belvedere*) were introduced at the end of the presentation, when probably most students were not as concentrated anymore to get new information which could be turned into their mental images.

Effect of the first user study

At the end of the first user study, after the virtual ‘Vienna city walk’ and mental mapping activity, participants were asked a concluding question to check if something changed for them after creating the mental maps. In total 21 respondents provided the answers. Among them, 57% of students stated that they were *more curious to explore Vienna*. 10% indicated that they were *looking forward to checking their mental images of Vienna*. For 14% of students, *Vienna became more familiar*, and one respondent (equivalent to 5%) claimed to have a *clearer image of the city*, whereas three respondents (14%) indicated that *nothing has significantly changed*. Of this latter group, two had already been to Vienna (Figure 4.5).

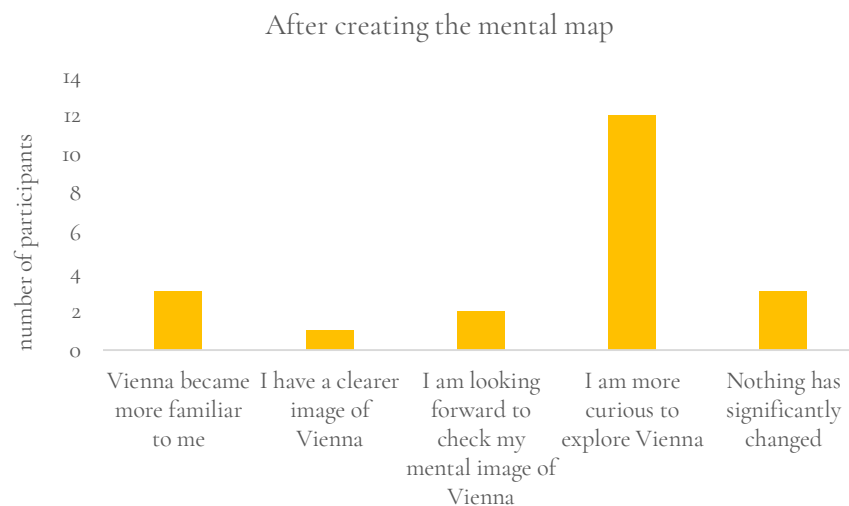


Figure 4.5: Attitude of the participants towards Vienna after the mental mapping activity.

The results show a clear trend of becoming more curious to explore the place which was presented in a virtual walk and depicted in the first mental maps. However, watching a presentation and drawing a mental image on paper does not necessarily mean either becoming more familiar with or forming a clearer mental image of the place. For most people who already physically experienced the place, taking the virtual ‘Vienna city walk’ or creating a mental map does not alter their impressions significantly.

4.1.3 Conclusion

The first user study aimed to understand the mental maps of Vienna drawn by the participants and their emotions before visiting the place. One of the core parts of this process was observing and interpreting the associations related to Vienna, which participants held before visiting and living in the city. These associations were diverse, and most of them related to the character of the city. Alongside the associated descriptive words, participants used quite generic expressions (excluding specific place names) to refer to their mental images. It is caused by holding impressions and expectations towards the places and sharing socially widespread opinions, rather than the first-hand experiences, such as memories, related to specific places and landmarks.

Alongside the associations, the first user study also aimed to determine how the mental image of and emotions towards Vienna were influenced by both prior knowledge, associations, and/or impressions of Vienna and the virtual ‘Vienna city walk’. The former factor is quite broad, combining cognitive experiences (attained through research), memories (first-hand experiences), associations or impressions, which accumulate over time and can be unconscious. In contrast, the latter had a rather specific, i.e. one-time experience, character. Evaluating prior knowledge, associations, and/or impressions of Vienna was challenging for the participants, especially regarding emotions. However, prior knowledge, associations and impressions which people hold towards places affect mental images and emotions quite similarly. These play an influential role mainly if they are based on personal experiences such as visiting a place. These mental images are well-established and cannot be easily affected or altered by giving new information with different means of media. The second factor of the virtual ‘Vienna city walk’ revealed its highly influential power (especially for those who had never been to the city before) on mental images and especially on emotions.

The impact of the ‘Vienna city walk’ on the mental images and emotions related to the city was defined by the media that was used. Visual media such as images and videos had the most decisive influence on mental images and emotions. The former was mainly influenced by images, whereas videos essentially triggered the latter. In terms of emotions, narrated stories were as influential as videos. This can also be explained by the role of the narrator and already established positive subjective attitude towards the person, which can accordingly evoke emotions. Maps played a minor influential role but only for mental images, as it helps establish their spatial organisation. However, they did not affect emotions and could not compete with other above-mentioned visual media. The text, which was given on slides of the virtual ‘Vienna city walk’, revealed no impact either on mental maps or emotions.

The influence of the virtual ‘Vienna city walk’ on the mental images and accompanied emotions was cross-checked by analysing a set of first mental maps. From 17 landmarks of the walk, 13 were depicted in the mental maps. This high number of included landmarks shows the impact of the first user study on the mental images that participants were holding towards Vienna. The landmarks that have the highest frequency are those to which students have personal relevance, such as *TUW* (feeling of belonging), *Donau* and *Donaukanal* (memorability of prominent natural elements), and *Stephansdom* and *Karlskirche* (visual properties and iconic character). Relating the mental maps and associations of Vienna (identified in the first user study), a clear image of the city emerges, one which is mainly defined by its artistic and cultural character and linked with positive feelings and expressions.

In the end, the overall effect of the virtual ‘Vienna city walk’ is noteworthy. The event did not necessarily cause participants to become more familiar with or form a clearer image of the city, especially those who already had a prior experience of Vienna. Nevertheless, the virtual ‘Vienna city walk’ has significantly evoked curiosity and anticipation towards the places presented in the virtual walk and generally towards the city.

4.2 Mental maps and emotions after exploring and living in that place

4.2.1 Recent associations related to Vienna

Associations representing the image of Vienna were studied again in the second user study, i.e. after the respondents visited and had been living in Vienna. The participants were asked to name three keywords, which represented their image of Vienna. The question was asked at the very beginning of the user second study to avoid the influence of the following ‘Vienna city walk’ on the associations of the respondents. In total, from 26 participants, 79 words were collected, which they associated with Vienna (Figure 4.6). Eleven associative words were used more than once: *Music* (seven times) followed by *Beautiful* (6 times), *Art*, *Culture* and *Donau* (five times), *Oper*, *Architecture* and *Historical* (four times), *Museums* (three times), *Liveable* and *Romantic* (two times).

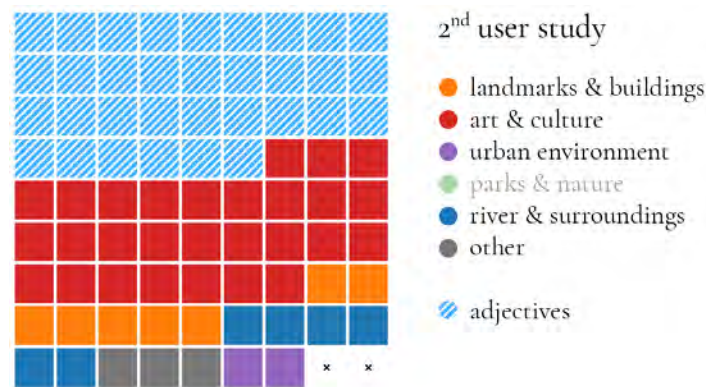


Figure 4.7: Recent associations related to Vienna by category.

In the first and the second user studies different associative words, 81 and 79 respectively, were collected which students related to Vienna. These words were grouped into different categories for further analysis. Some of them were mentioned more than once. The number of those words did not change a lot, however, the frequency of them has increased significantly and consisted of 35% of the words from the first and 60% of the words from the second user study. The most frequently mentioned words were *Music* and *Beautiful* (they both comprise 17% of all mentioned words in each user study), followed by different art- and culture-related words as well as the name of the river.

The leading group of the associations which students held towards the city before and after visiting and living there are the *adjectives*. They were used to describe the visual and characteristic properties of the place. These associative *adjectives* show a very stable nature between the two user studies in terms of the quantity (34 adjectives in each user study) as well as their meanings. However, the associative words of the students expressing the character of the city are more diverse (nine words in the first and 16 words in the second user study) after having a living experience in Vienna. While being in Vienna, respondents gave more concrete adjectives to describe the properties of the city, although the context of the words had not changed.

The category *other* was reduced three times from the first to second user study. This category mainly includes both the names of famous people (*Mozart*, *Strauss*, *Sisi*, *Klimt*) and facts with historical meanings (*Habsburgs*, *Treaty of Vienna*, *Vienna convention*, *Empire*). Before becoming familiar with the city, students were holding associations including the facts and people for which Vienna is famous. After gaining lived experiences, the proportion of these words decreased significantly. In the second user study, famous people were represented only by *Klimt* - an Austrian artist. The reason for this can be that students visited the museums where his masterpieces are exhibited. The words showing historical meanings were quite similarly affected. In the second user study, they were only represented by the words *Empire* and *Heritage*. These words are also quite broad, and in addition to their historical and cultural meanings, they can comprise not only the different buildings from the time of the empire but also cultural patrimony located in numerous museums or art-related facilities of Vienna. Associations that show socially widespread facts with cultural and historical importance are replaced by those which are experienced physically.

Looking at the words which are related to the places, i.e. all words excluding the categories of *adjective* and *other*, there is a clear tendency that only a small number of words indicate a specific place and/or feature names. In the first user study, these words were *Donau*, *Stephansdom*, *Stephansplatz*, and *Prater*. They were classified in the categories of *river & surrounding*, *landmarks & buildings*, *urban environment* and *parks & nature* respectively. In the second user study, place names were *Donau*, *Donaukanal*, and *TUW*; the first two were classified as *river & surroundings* while the last was *landmarks & buildings*. In both user studies, these proper nouns of places consisted of approx. 9% of collected associative words. With the word *Oper*, which was quite frequently mentioned as in the first (two times) as well in the second (four times) user study, it is difficult to define whether students were referring to a landmark *Oper* or in general *Opera*, as a musical style or a part of the performing arts.

The category *art & culture* is the second leading group of associative words after the *adjectives*. It includes art-related generic words (such as *Music*, *Museums*, *Opera*, *Art*, and *Culture*) as well as gastronomic words (*Coffee houses*, *Schnitzel*, *Sachertorte*, etc.). In the second user study, the share of gastronomic words decreased four times accompanied by an increase in the proportion of art-related words. This suggests that the associations related to Vienna are largely based on visual and performing arts, and this image gets stronger after living in the city. However, the words represented in the category of *art & culture* are quite broad and do not include any specific landmark names. In the case of the *Oper*, as mentioned above, it is not clear whether respondents meant *Opera* as a landmark, musical style or a part of the performing arts. Talking about the trend of expressing associations with generalised words, the parallel can be made with the fairly smaller category of *landmarks & buildings* where words are also generic (*Architecture*, *Fancy buildings*, *Palaces*). Moreover, these words are nearly the same in the first and second user studies. It was expected that after living in Vienna, the associations of the respondents would get richer, i.e. they would name some landmarks as their associations. However, in the category of *landmarks & buildings*, in each user study, there is presented only one concrete place name - *Stephansdom* and *TUW*, respectively. It shows that people well familiar with the places still tend not to specify particular place names while expressing their associations. Another reason for frequently used generic words can be the requirement of the survey - providing three keywords that represent the image of Vienna. This represents quite a limited number especially for participants who are already familiar with the place. As a result, all known and associated places and landmarks related to the image of Vienna can be generalised and grouped into broader words, such as *Museums*, *Art*, *Architecture*, *Palaces*, or abstracted and expressed by adjectives combining common properties of many objects.

Based on Mercer's international comparative study¹⁰, which assesses the quality of life for more than 450 cities throughout the world, Vienna was named as the most liveable one. The capital of Austria got this status in 2019 for the tenth time in a row (since the Corona pandemic there has not been released a new 'Quality of Living City Ranking'). Next to the different political, social and economic components, the survey of Mercer also considers recreational facilities (theatres, cinemas, restaurants, etc.), environmental, and infrastructural conditions, including transport systems. A well-developed public transport network was also reflected in the

¹⁰ Mercer. <https://mobilityexchange.mercer.com/insights/quality-of-living-rankings> (last accessed 10/2021)

associative words such as *Good public transport*, and *U-Bahn*, which were classified under the category of *urban environment*. The most liveable city status of Vienna was also seen in the collected associations, expressed directly with the adjective *Liveable* (two times).

In addition to the status of the most liveable city, Vienna is also considered the world's greenest city¹¹ due to its methodical city planning and green spaces which is one of its identities. However, *parks & nature* was not well-presented in the associative words. In the first user study, this category was presented only with *Prater*, the place which can be considered not only a green space but also an amusement park. In the second user study (after living in Vienna for several months), there were no associations related to parks. Thus, an important identifier of the greenest metropolis of the world is not reflected in the associations and is overshadowed by its cultural value and aesthetic properties. However, holistic analysis of the results gives the impression that the quite often mentioned *Donau* can be an association related not only to the river but also to the green space, for instance, the *Donauinsel*. *Donauinsel* is an important recreational region of Vienna, which is 21km long, offering a space for various outdoor activities. This green area was often named by the respondents as a favourite and important place, which can support the impression of considering *Donau* also as a part of green spaces.

4.2.2 Impact of the on-site 'Vienna city walk'

The second user study aimed to observe the influence of the on-site 'Vienna city walk' on mental images of and emotions towards Vienna. The 'Vienna city walk' took place in person with the same 24 students, who had already participated in the first user study. It covered the same 17 urban landmarks (as the first user study) divided into three thematic routes. The 'Vienna city walk' consisted of the walk, narrated facts, and shared personal experiences/stories.

To find out the influence of on-site 'Vienna city walk', on the one hand, and *experiences while living in Vienna*, on the other, on the mental image of and emotions towards Vienna, students were asked to evaluate the statements on a Likert scale from 1 (*very influential*) to 5 (*not influential*).

Influence of living experiences and the on-site 'Vienna city walk'

The respondents were asked to rate the statements shown in the Figure 4.8 on a Likert scale from 1 (*very influential*) to 5 (*not influential*). The vast majority of 24 respondents identified that for their images of Vienna, *living experiences* were *very influential* (1) and *influential* (2), approx. 71% and 13% respectively. In the case of emotions, the majority also named the same factor as *very influential* (1) and *influential* (2), approx. 50% and 33%

¹¹ Best cities. <https://www.bestcities.org/news/2020/04/22/the-worlds-greenest-cities/> (last accessed 10/2021)

respectively. Only one participant stated that *living experiences* did not have any influence either on their mental image or emotions.

The influence of the ‘*Vienna city walk*’, a sum of the answers *very influential* (1) and *influential* (2), on mental images was named by 63% of respondents and on emotions by 54%. Here as well, only one respondent indicated that ‘*Vienna city walk*’ did not have any impact on their current mental image of the city. For 13% of the students rating the impact of *living experiences* and ‘*Vienna city walk*’ was difficult. The number of students who decided for the *neutral* (3) answer in evaluating the connection between the ‘*Vienna city walk*’ and *emotions*, is even higher and reaches 25%.

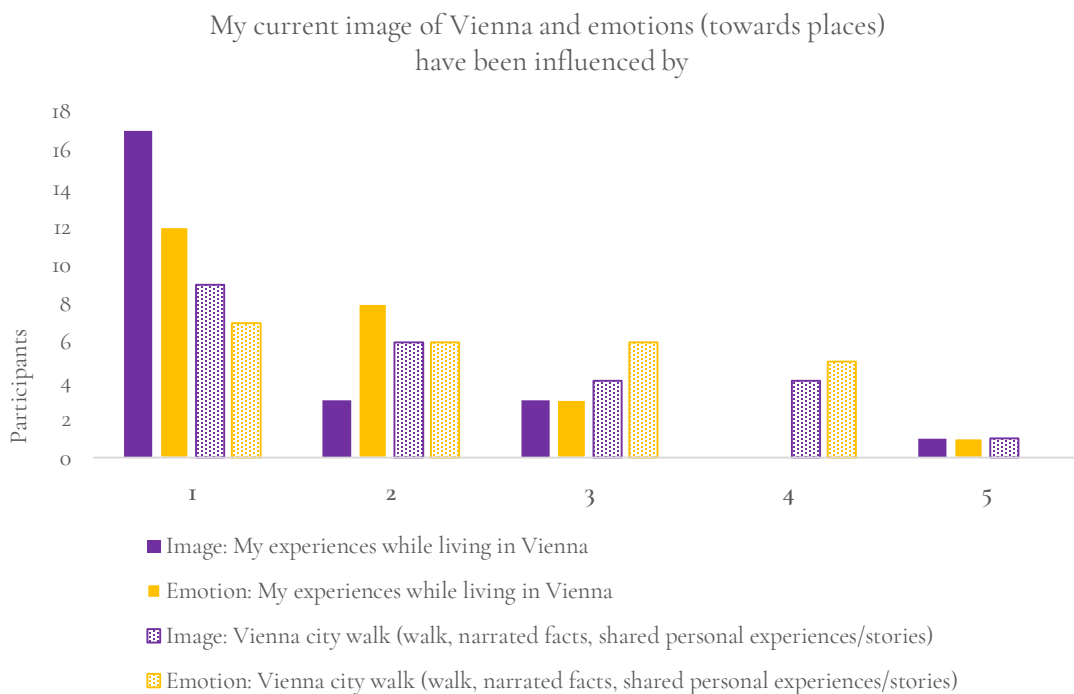


Figure 4.8: Influence of the two different factors on the second mental images and emotions.

In the first user study, i.e. before visiting Vienna, the majority of respondents stated that the *virtual* ‘*Vienna city walk*’ was influential (*very influential* (1) and *influential* (2)) for their mental images (58%) and emotions (67%). A higher proportion of emotions was caused by discovering a new place and forming the first impressions, which are often accompanied by emotions. Compared to emotions, which can be triggered more easily, shaping a mental image after a virtual presentation can require more time.

In comparison to the first user study, by the time of the second user study, students had already been living in Vienna for around three months. When they were asked a similar question about rating the on-site ‘*Vienna city walk*’, the overall results have been somewhat altered where the ‘*Vienna city walk*’ showed more impact on the

mental image (67%) than on emotions (54%). The change of the trend was expected as the on-site experience and visiting the landmarks significantly affected the shaping of the mental images, whereas the emotional attachments with already known places were formed not instantly, i.e. while the city walk, but over time, during the living experience. However, in the second user study, 'Vienna city walk', previously the most influencing factor, was replaced by the *living experiences* of the respondents. The personal *living experiences* were evaluated as influential (*very influential* (1) and *influential* (2)) for mental images and personal emotions by 84% of respondents.

Influence of the 'Vienna city walk' components

As mentioned before, the 'Vienna city walk' included several components such as the *walk*, *narrated facts* about the landmarks, and *personal experiences/stories* which were shared by the interviewer. At the end of the 'Vienna city walk', it was evaluated whether and how intensively these components influenced respondents' image of and emotions towards Vienna.

The results show that for the vast majority of respondents, each component of the 'Vienna city walk' was influential for their mental images as well as for emotions towards the city. Interestingly, in both cases, the answers reveal the same trend. *Shared personal experiences/stories* is the leading component in shaping the mental image and emotions towards places for 96% and 92% of respondents, respectively. It is followed by the *narrated facts* (79% and 67%) and the *walk* (75% and 58%). Some participants who chose the answer *maybe* were unsure whether the *walk* and *narrated facts* influenced either their mental images (18%) or emotions (29%). For each component of the 'Vienna city walk', the negative answer ratio was not more than 4% (equivalent to one respondent), except for the influence of the walk on emotions, where three respondents (12.5%) denied this impact (Figure 4.9).

In addition to the given answers, students were free to provide other reasons which they thought were influential on the one hand for their mental images, on the other for their emotions. In the category *other* five students provided additional influential factors which formed their mental images, such as: "words from the people around", "tourism and media I consumed before and after arriving in the city", "own experiences", "being physically there with friends", and "good weather and restaurants being open". Four respondents named that the following aspects have influenced their emotions: "sunny weather after days of rain", "restaurants open", "weather (emotions towards the same place can be different in different weather)", and "music, art, movies".

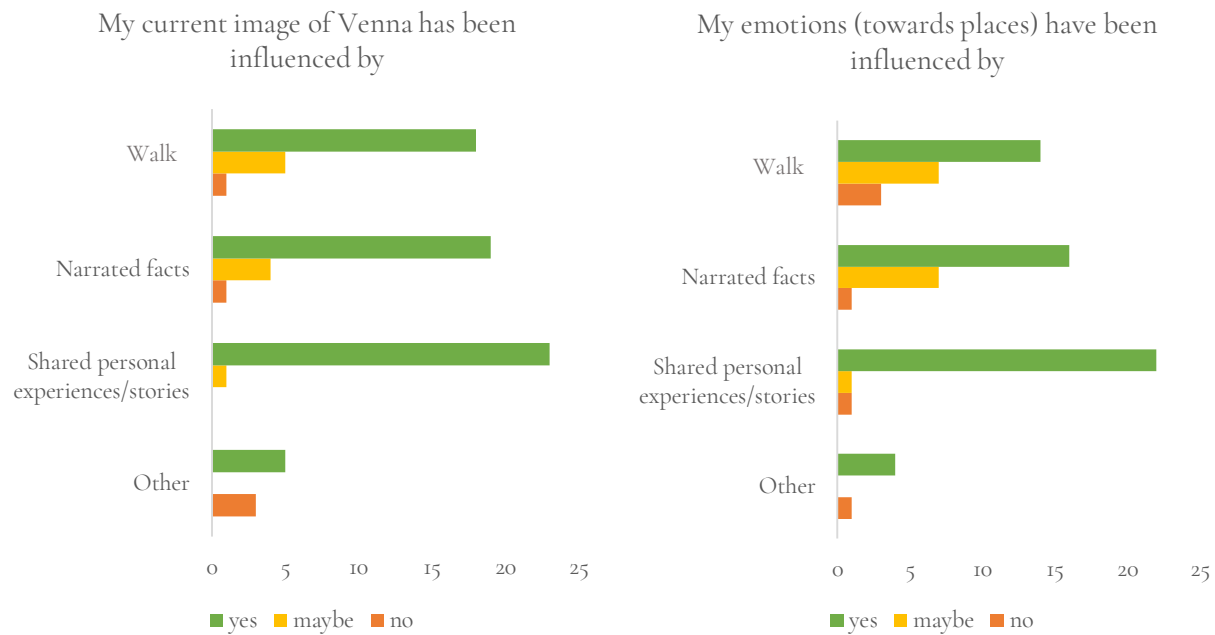


Figure 4.9: Whether the components of the on-site 'Vienna city walk' had an impact on mental images and emotions.

To conclude, all consisting components of the 'Vienna city walk', *walk*, *narrated facts*, and *shared personal experiences/stories*, had a significant impact on both mental images of and emotions towards Vienna. Especially influential was the latter. Two other components, such as *narrated facts* and the *walk*, largely influenced especially the mental images, whereas for emotions evaluating them was not as easy for the participants. Based on the results, it can be concluded that personalised stories are remembered better and therefore, they have a greater influence on mental images and emotions. These stories give context to landmarks and create the bonds between individuals and the environment around them. This kind of context is also given to places by the narration of the official or historical facts. However, they can be less exciting and difficult to follow or remember as they do not create an immediate, experience-based connection between the places and people. As a result, these kinds of facts are less reflected in the mental images and emotions. The *walk* also showed its influence; however, it was slightly smaller than the other two. The landmarks covered in the walk were mainly located in and around the city centre. Accordingly, after living in Vienna for around three months, students were mainly familiar with those places. The *walk* was not a first experience of getting to know those landmarks, rather a refresher and a way of seeing places differently. However, places that were visited the most recently, i.e. during the *walk*, renewed mental images, which are changeable, and also had an impact on emotions that were related to those places.

One of the aims of the second user study was to find out the influential power of the 'Vienna city walk' on shaping the participants' mental image of the city and personal emotions. However, it is obvious that not only the 'Vienna city walk' affected mental images and emotions but different factors have played a significant role as well. A small but valuable input of participants supports this opinion. Personal experiences, including

memories (spending time with friends), prior knowledge (together with the media, touristic business, art, and culture), as well as the environment (such as good weather and loosening pandemic restrictions), play an important role in the mental images and emotions. The immediate surroundings also show a strong influence. In terms of emotions, good, sunny weather revealed a compelling impact, whereas for mental images the comments of participants, which were made while drawing, were reflected in the mental maps.

During the interview session, the influence of the ‘Vienna city walk’ components (*walk*, *narrated facts*, *shared personal experiences/stories*) on the mental image and emotions of the participants was once again cross-checked. This time, respondents were free to choose more than one answer. As a result, 37 responses were collected from 24 participants (Figure 4.10). Here as well *shared personal experiences/stories* was the leading factor for the mental images as well as for emotions (40% and 46% respectively). It was followed by *narrated facts* (30% for images and 32% for emotions), and the *walk* (30% - images, 22% - emotions).

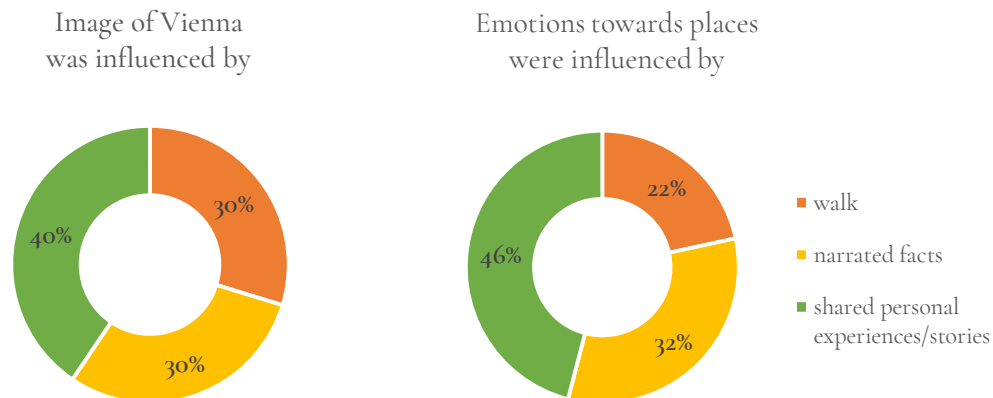


Figure 4.10: Influence of the components of the on-site ‘Vienna city walk’ on mental images and emotions.

The influence of the components of the ‘Vienna city walk’ has been sustained after the walk. About the impact of the *walk*, *narrated facts* and *shared personal experiences/stories*, the students were once again asked during the interview session, which was held within two weeks after the ‘Vienna city walk’. This time, respondents could choose more than one influential component. The students had a choice to give multiple answers; this caused a decrease in the difference between the ratio of responses. However, the trend remained the same: *shared personal experiences/stories* stayed the most influential, followed by *narrated facts* and the *walk*. The stories and personal experiences which were shared with respondents during the walk stayed in mind of students even after some time. *Narrated facts* and the *walk* showed the same weight in the formation of the mental image but not necessarily for emotions. It shows that the *walk* and a physical visit of the places are important for the mental image as visual memory is also largely involved in this process. However, the *walk* is the least important factor in evoking or forming emotions. In this case, the narration and storytelling aspect is the most compelling.

Frequently depicted elements in the second mental maps

After the virtual ‘Vienna city walk’, students were asked to draw their mental maps of Vienna. The initial 17 landmarks (covered in the first user study) were divided into three groups corresponding to different walks. In each walk, five to seven landmarks of Vienna were covered.

The analysis of map elements shows that 187 distinct elements were presented 723 times in the second mental maps. Among them, 17 landmarks (9% of all depicted elements) of the ‘Vienna city walk’ consisted of 34% of the frequency of all elements. Of the first 20 most frequently depicted landmarks, 67% were also part of the ‘Vienna city walk’: *Albertina*, *Stephansdom*, *Donaukanal*, *TUW*, *Belvedere*, *Oper*, *Karlskirche*, *Museumsquartier*, *Stadtpark*, *Rathaus*, *Musikverein*, and *Burggarten*. Their presence in the leading rankings is largely defined by the personal relevance, the iconic character of landmarks, and their location (being clustered close to each other). Most landmarks and places (except for the *Rathaus* and *Musikverein*) were associative, favourite, important, or emotional; all of this defines their relevance for the participants. The high presence of *Rathaus* and *Musikverein* in the mental maps can be mainly explained by the ‘Vienna city walk’.

Landmark	Frequency
Albertina	27
Stephansdom	27
Donaukanal	25
TUW	23
Belvedere	21
Donau	20
Oper	18
Home	18
Karlskirche	17
Donauinsel	17
Museumsquartier	15
Stadtpark	13
Rathaus	11
Karlsplatz	11
Ring	11
Musikverein	10
Burggarten	10
Hofburg	9
Schönbrunn	9
Wienfluss	9

Table 4.2: The most frequently depicted elements in the second mental maps.

In addition to the landmarks of the 'Vienna city walk', there are also presented those which were not part of it, such as *Donau*, *Home*, *Donauinsel*, *Karlsplatz*, *Ring*, *Burggarten*, *Schönbrunn*, *Wienfluss*. The presence of *Donau* and *Donauinsel*, *Schönbrunn*, and *Hofburg* with a high proportion is caused by their relevance for the respondents, i.e. they are parts of emotional and favourite, as well as important and associative places. *Home* is also often depicted element, as it is an integrated part of the Viennese life for the students, accordingly often a core part of the mental maps and related emotions. *Karlsplatz* and *Burggarten* were no single standing landmarks of the 'Vienna city walk', however, they were passed during the walk and quite an attention were brought to them. Another frequently presented element is *Ring*, which is a part of associations and gives a certain structure to the city.

The landmarks from the 'Vienna city walk' which are not presented in the given list, are *Kunsthistorisches* and *Naturhistorisches* museums (each of them depicted seven times), *Burgtheater* and *Volksgarten* (six times each), and *Urania* (five times). Their presence in the maps is mainly influenced by the 'Vienna city walk' as almost none of them had personal relevance, for the students i.e. they were not parts of either associated (except for the *Naturhistorisches* museum), favourite, important, or emotional places.

Effect of the second user study

The study aimed to evaluate how the on-site experience, 'Vienna city walk', shaped the mental image of the city and influenced personal emotions towards places. After the walk, respondents were asked a question to find out whether there was a change in their attitudes towards Vienna.

Based on the results of 24 students 'Vienna city walk' showed that it had changed the respondents' (83%) attitude towards the place. All students indicated that after the walk they became *more curious to further explore the city* and that they *learnt something new about the city*. The majority (88%) also mentioned that they *feel a greater connection to the city* (Figure 4.11).

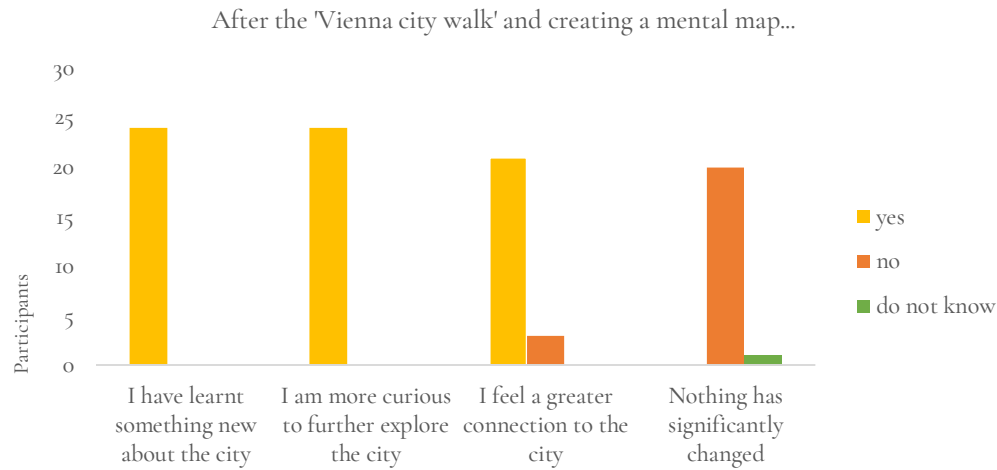


Figure 4.11. Influence of the on-site experience 'Vienna city walk'.

4.2.3 Conclusion

The second user study aimed to understand the mental maps of Vienna drawn by the participants and their emotions after exploring and living in that place. The associations related to Vienna were once again observed after the participants gained living experiences in Vienna. This time as well, they were diverse and mainly generic, i.e. abstract and expressed by the words combining common properties of many objects. Associations showed thoughts and expectations before getting acquainted with the place; later, they were enriched and shaped by people's impressions and personal experiences from the surrounding environment. Observing the associative words revealed that they have a very stable character and do not alter easily over time. They might become more specific, but the context remains the same. They are often expressed by adjectives or broad words illustrating positive visual qualities and characteristics of the city, art- and culture-related words, and the river and its surroundings. The associative words related to places also stay generic, i.e. with only a few specific place or landmark names. Accordingly, people even more familiar with the places still generalise and abstract their associations. Collected associations also reflect the identities of Vienna that make it the most liveable and the greenest city in the world. However, the city's cultural value overshadows them and emphasises Vienna's art- and culture-related image.

The second user study aimed to determine how the mental image of and emotions towards Vienna were influenced by both respondents' experiences while living in Vienna and the on-site 'Vienna city walk'. The 'Vienna city walk' had more impact in the first user study, whereas living experiences were more influential in the second. However, the walk still had an impact on mental images and emotions. This influence was also different between the user studies. For the former user study, the virtual 'Vienna city walk' had a higher impact on emotions. It was caused by the excitement and anticipation of getting to know more about the place

respondents would move to, whereas forming a mental image of a yet unknown place needs more time than a virtual presentation. In contrast, in the latter user study, the influence of the on-site ‘Vienna city walk’ was less on emotions than mental images. In other words, on-site experience has primarily affected the shaping of the mental image, whereas emotional attachments were already formed during living experiences in Vienna.

Shaping the mental images of Vienna and influencing personal emotions towards the city were affected by the components of the ‘Vienna city walk’. Testing these components, the walk, narrated facts, and shared personal experiences/stories revealed that the latter had a remarkable impact on mental images and emotions. These stories gave context to landmarks and created the bonds between individuals and the environment around them; therefore, they were remembered better and had a more significant influence. Narrated facts and the walk itself largely influenced the mental images (for emotions evaluating these components was not easy for the participants). Narrated official facts about the landmarks and places can be unexciting or somewhat challenging to follow and accordingly to remember. As a result, they do not create an immediate connection (as in the case of shared personal experiences/stories) between the places and people. Therefore, they are less reflected in the mental images and even more so in emotions. At last, the influence of the walk is the least among other components, as with most places which were covered during the ‘Vienna city walk’ participants were already familiar with, and it did not have as a novel character as other components. The walk played more of a role in reviving existing memories and enriching them with new experiences, which also impacted mental images and emotions related to those places. In addition to the ‘Vienna city walk’, participants’ mental images and emotions attached to places were shaped by other factors. Among them, personal experiences (living experiences in Vienna), memories (socialisation with friends), prior knowledge (also defined by media, tourism, art- and culture-related image of Vienna), and general environment (loosening pandemic restrictions and weather condition especially in the case of emotions) are distinguishable.

The map analysis of depicted elements shows that the second mental maps mainly include the elements which have significant personal relevance for the map-maker, i.e. they primarily reflect those landmarks and places that are associative, favourite, important, or emotional. In addition, they also show those elements that were only the parts of the ‘Vienna city walk’. This shows an influential role of the ‘Vienna city walk’ on participants’ mental images and emotions. In addition, frequently included elements have remarkable visual character. Moreover, location factor (being clustered close to each other) also plays an important role.

In the end, the overall effect of the on-site experience, the ‘Vienna city walk’, revealed a remarkable impact on the attitude of respondents towards the city. A vast majority stated a greater connection to the city, which is related to their emotional attachments to the places. Moreover, all participants shared that they were more curious to explore the city further and have learnt something new about Vienna, which became a part of their mental images and emotions.

4.3 Mental image of the city

4.3.1 Associated, favourite, important, and emotional landmarks and places

In the second user study, apart from the general associations representing the image of Vienna, the students were also asked to name the landmarks which they associate with the city, as well as a personal favourite, important, and emotional places. The collected answers were grouped in the following categories: *landmarks & buildings*, *art & culture*, *urban environment*, *parks & nature*, and *river & surroundings*. In the case of important and emotional places, the category *other* was also added. Each category consists of different types under which the landmarks, favourite, and important places were classified (Table 4.3).

Landmarks & Buildings					
Palace	Church	Churches generic	University	Building	Statue
Art & Culture					
Performing arts	Museum	Arts generic	Gastronomy	Shop	
Urban Environment					
Square	Transport	Street	Streets generic	District	
Parks & Nature					
Park	Parks generic	Nature	Nature generic		
River & Surroundings					
River	Channel	Island & surroundings			
Other					
Home	Friend's place				

Table 4.3: Categories and their corresponding types used to classify associated, favourite, important, and emotional landmarks and places.

The categories and corresponding types were created based on the collected responses, i.e. they are fitted to the data of this study. Hypothetically, one word could be classified in more than one category; however, in this chosen framework, they are grouped based on the context in which they were used or their prior function. Classification challenges and ambiguity can be seen in the example of the word *Oper*. *Oper* can be considered as a building or a venue of performing arts. Nevertheless, in this study, *Oper* is classified with the latter, in the category of *art & culture*, as it shows the main function of this landmark. Another aspect that should be clarified is so-called *generic* types (such as *churches generic*, *parks generic*, *streets generic*). If participants did not give a specific name of the church, park or street, they were also classified in these rather generalised groups. In the following chapter, the word *landmarks* are understood with their broader context which refers to both prominent objects (such as palaces, museums, streets) and features (river, parks, nature, etc.).

Associated landmarks and places

Participants were free to name as many associative landmarks of Vienna as they wanted. The Figure 4.12 below gives an overview of how the associated landmarks were distributed into the categories, also taking into account their frequency. Based on the results, in total, 30 associated landmarks were given by the respondents, and 50% of them were named more than once. The leading associated landmarks of Vienna were *Oper* (mentioned nine times), *Stephansdom* (eight times), *Schönbrunn* and *Karlskirche* (six times), *Hofburg* and *Donau* (five times), and *Museumsquartier* (four times). For these seven places (with 43 votes in total), the leading category is *landmarks & buildings* (58%), followed by *art & culture* (30%), and *river & surroundings* (12%).

By the frequency of the landmarks per category, *landmarks & buildings* (33.5%) and *art & culture* (23.5%) are leading. They are followed by *parks & nature* (20%), *urban environment* (13%), and *river & surroundings* (10%). In terms of the frequency of each category, i.e. the total number of landmarks which they include, *landmarks & buildings* (43%) and *art & culture* (27%) stay in the leading positions. Afterwards, in comparison to the above-mentioned frequency proportions of the landmarks per category, there is a change with an increased portion of *river & surroundings* (13%), followed by *urban environment* (10%), and *parks & nature* (7%).

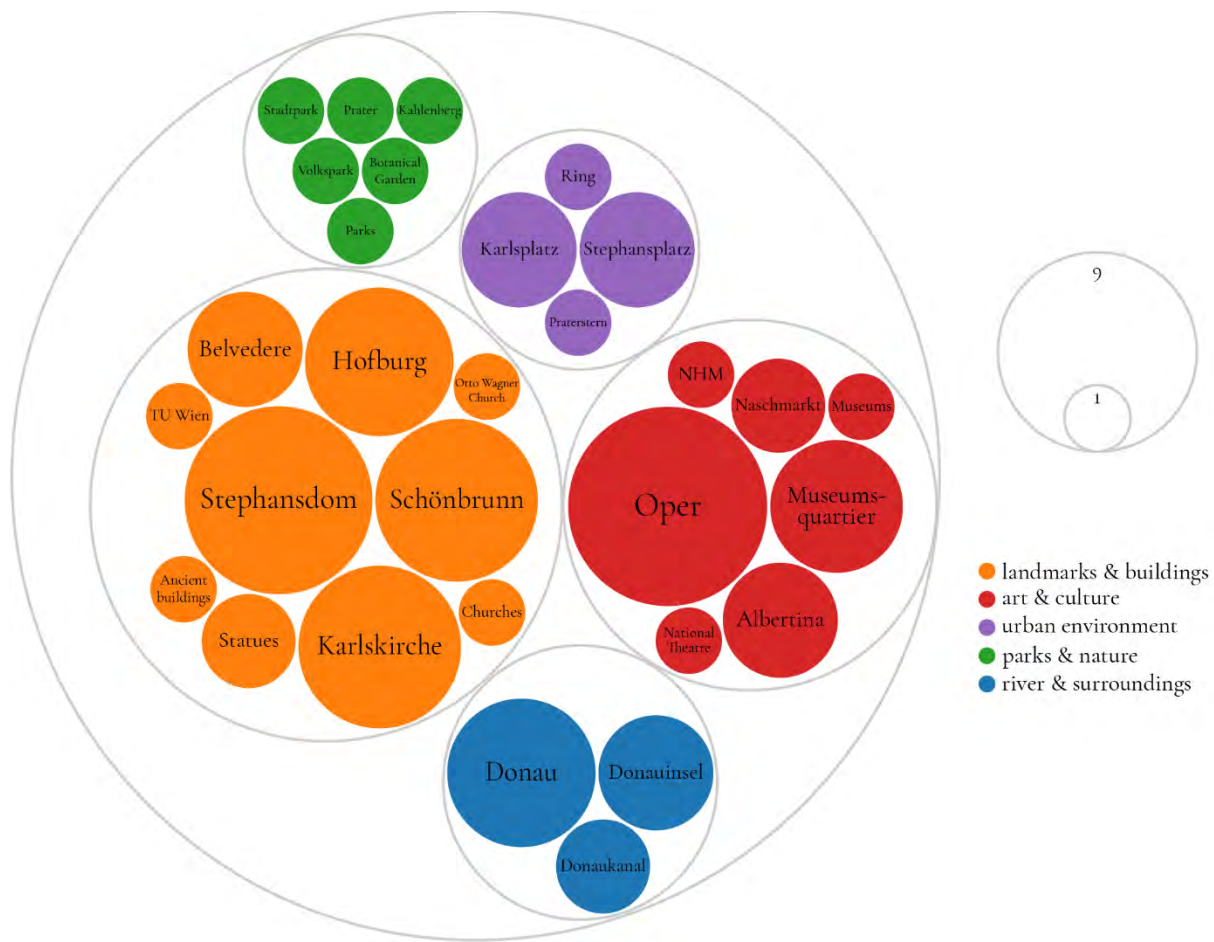


Figure 4.12: Associated landmarks and places of Vienna.

During the interview session (after the 'Vienna city walk'), students were presented to the associated landmarks of Vienna, which they named at the beginning of the 'Vienna city walk'. This time they were asked to describe why they thought that these landmarks were memorable. Their answers were grouped into the following categories: *personal relevance*, *visiting patterns*, *characteristics*, *outdoor activities*, and *built & natural environment*. Based on the findings, for the associated landmarks of Vienna, *personal relevance* (38%) has the highest proportion among the categories. This group includes memories (30% within this category), socialisation and meeting friends, familiarity with landmarks due to promotion by the media or being frequently seen in the city (12% each), different associations, experiences, and personal preferences. The next category of *visiting patterns* (31%) combines visit-related reasons that students have named; among them are visiting or passing through places frequently (56% within this category) and visiting places for the first time (33%). The following is the category *characteristics* (21%), where the respondents named different characteristics of places (visual, functional or emotional attributes) that made them memorable. The final two categories (5% each) are *outdoor activities* (doing sports and enjoying being outdoors) and *built & natural environment* (connecting points or natural elements) (Figure 4.13).

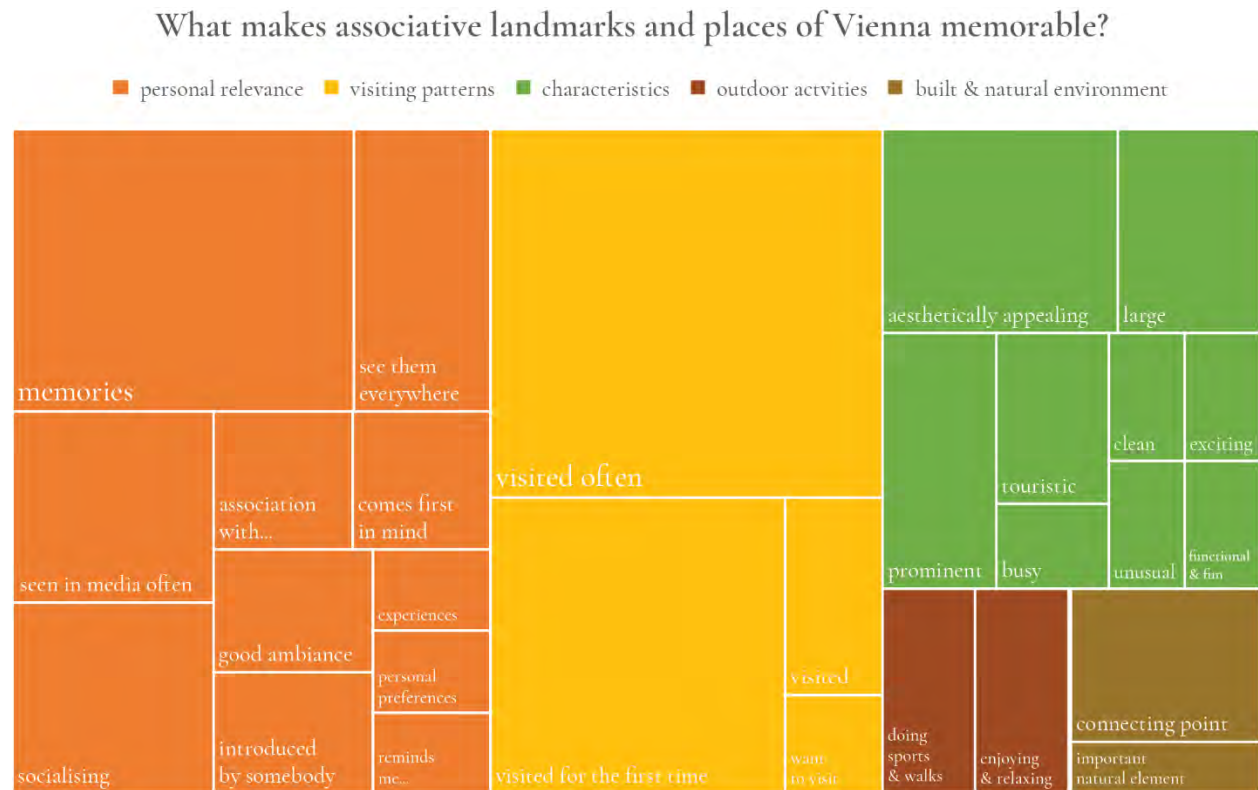


Figure 4.13: The reasons that make landmarks and places associative.

Looking at the associative landmarks, categories of *landmarks & buildings* and *art & culture* are leading both with the number of elements which they comprise and with the frequency of elements within those categories. *Oper* is the most often mentioned associative landmark, which reflects one of Vienna's identities being associated and related to music and art. For the respondents, this association was based on personal relevance (associations with music, the first association while thinking of Vienna, often seen in media, etc.), visited patterns (often visited/passed or desire to visit), and characteristics (touristic character, positive visuals and aesthetics such as *stunning* and *prominent*). The landmarks, which follow *Oper*, are all from the category *landmarks & buildings* - *Stephansdom*, *Schönbrunn*, *Karlskirche*, and *Hofburg*. They are either main churches or palace complexes of Vienna. Most participants have never been inside of them; however, they turned into their associative landmarks of Vienna. The reason for this can be found in the responses of the students explaining that these landmarks were memorable mainly because of personal relevance (related memories, first associations, often seen in media). Furthermore, visiting patterns (often visited or for the first time visited landmarks) played an important role. However, it should be clarified that in terms of *visiting patterns*, it is not meant visiting the interior of the building, rather being outside of it. Palaces of *Schönbrunn* and *Hofburg* are complexes instead of impressive single standing buildings. They include different art or administrative facilities (where most participants had not been inside either), as well as parks, which are accessible for the public. The point of accessibility turned them into associative landmarks as well. An additional factor that played an important role in landmark memorability is their characteristics (size-related properties, aesthetics,

and emotional responses related to these features). All this reveals that next to Vienna's music-related image, personal impressions and experiences, as well as visual qualities of buildings, play an important role in forming memorable associative relations between the landmarks and the city.

Another significantly associated landmark was *Donau*. The river is not flowing in the immediate city centre where other associative landmarks are clustered; however, its strong character as a natural element makes it also a significant associative element of Vienna. Students explain its memorability with the same reasons which were mentioned above for other landmarks, such as visiting patterns and personal relevance, as well as the additional reason of having opportunities for outdoor activities. The other landmarks that were named as associated with Vienna are *Museumsquartier*, *Belvedere*, *Karlsplatz*, *Stephansplatz*, *Albertina* and *Donauinsel*. All of them, except the last two, are squares (*Karlsplatz*, *Stephansplatz*) or complexes (*Museumsquartier*, *Belvedere*), i.e. a combination of several buildings and open spaces which are accessible to the public. *Albertina*, which is the only mentioned museum in the leading ranking, is also related to personal relevance, and additionally, it is visited (actual visit of the museum) by several students. *Donauinsel* takes its relatively high ranking for similar reasons as *Donau* (socialisation, spending free time, etc.). All the above-mentioned reasons and bigger categories (*personal relevance*, *visited patterns*, *characteristics*, *outdoor activities*, and *built or natural environment*) make the landmarks associated with Vienna memorable.

Favourite landmarks and places

Next to associated landmarks, respondents were also asked to name their favourite places without any number restriction as they wanted. As the results reveal, in the case of favourite places, the scenario has changed. The total number of named landmarks increased and reached 36, among which 36% (13 words) of landmarks were mentioned more than once. The most favourite places were *Donauinsel* (named 10 times), *Donaukanal* (seven times), *Schönbrunn* and *Donau* (four times each), *Belvedere*, *Hofburg*, *Karlsplatz* and *Altstadt* (three times each). These eight favourite places (with 37 votes) are mostly from the category *river & surroundings* and *landmarks & buildings* (37.5% each), followed by *urban environment* (25%) (Figure 4.14).

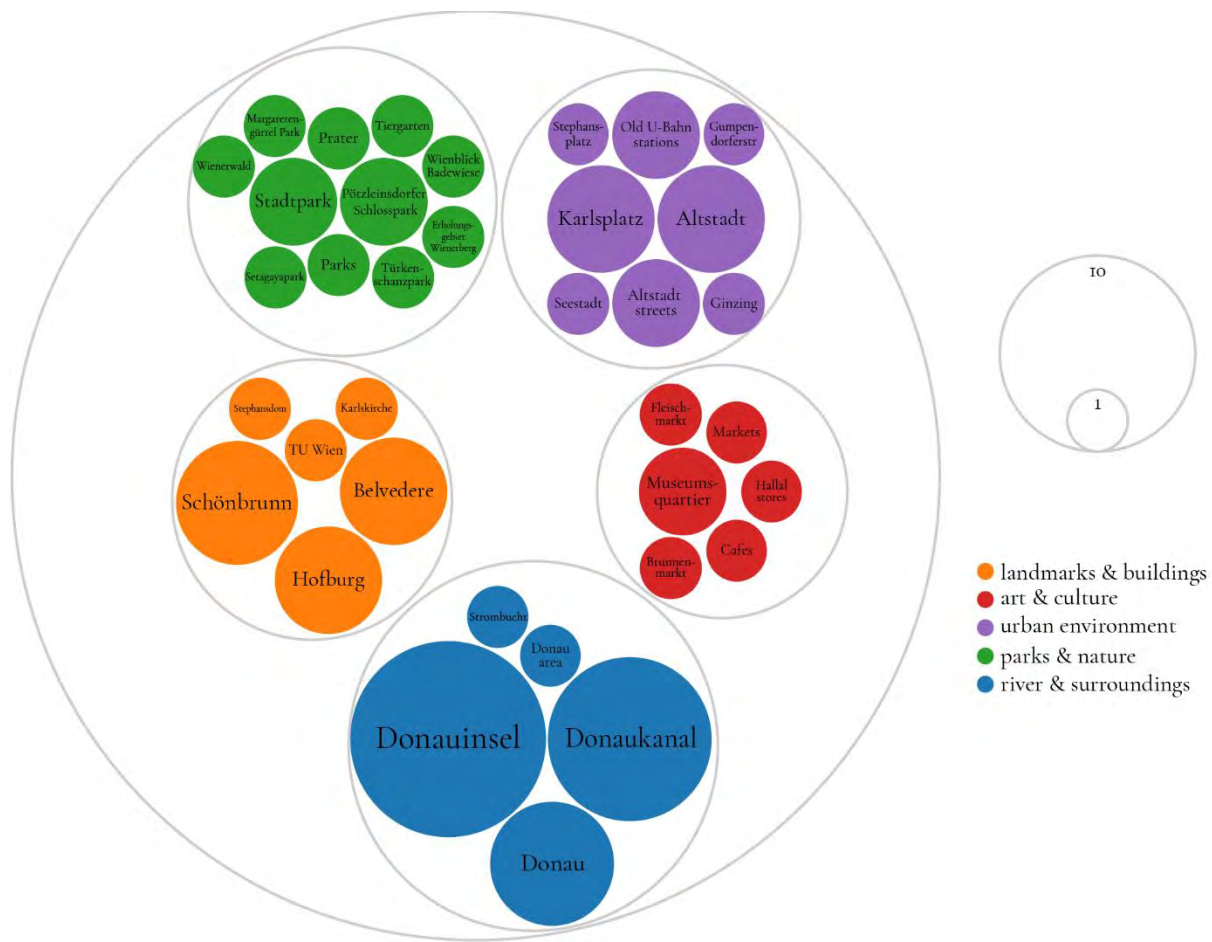


Figure 4.14: Favourite landmarks and places in Vienna.

In the case of favourite places, the frequency of the landmarks per category is distributed as follows: the majority of landmarks are within the category *parks & nature* (31%) and *urban environment* (22%), followed by *landmarks & buildings* and *art & culture* (17% each), and at last *river & surroundings* (13%). In terms of the frequency of each category, i.e. the total number of landmarks which they include, *river & surroundings* (33%), which is represented by the fewest words (five words), shows the highest frequency among other categories, followed by *urban environment* (20%). The next categories are *parks & nature* and *art & culture* (18,5% each). *Landmarks & buildings* (10%) are represented with the lowest frequency.

The students were also asked what makes a place a favourite of theirs. Their answers were grouped in the same above-mentioned categories. Here as well, the category *personal relevance* (43%) is in the leading position. The major factor within this category is personal preferences (29%), followed by meeting friends and socialisation (20%), memories (16%), and positive emotions (9%). The next category is *characteristics* (22%), where the largest proportion (61% within this category) has words which were describing positive visual and aesthetic properties. Other descriptives were size-, function- and character-related. The third-largest category is *built & natural*

environment (16%), with the largest proportion (41% within this category) of green spaces, followed by the architectural component, viewpoints, and location (18% each within the category). The category *outdoor activities* follows with a very similar proportion (14%), which is represented with sport-related activities (67% within the category) and enjoyable feelings (33% within the category). The last category which makes a place a favourite of the participant is *visiting patterns* (5%), where often visits are more influential than the places which were visited for the first time, 80% and 20% (within the category) respectively (Figure 4.15).

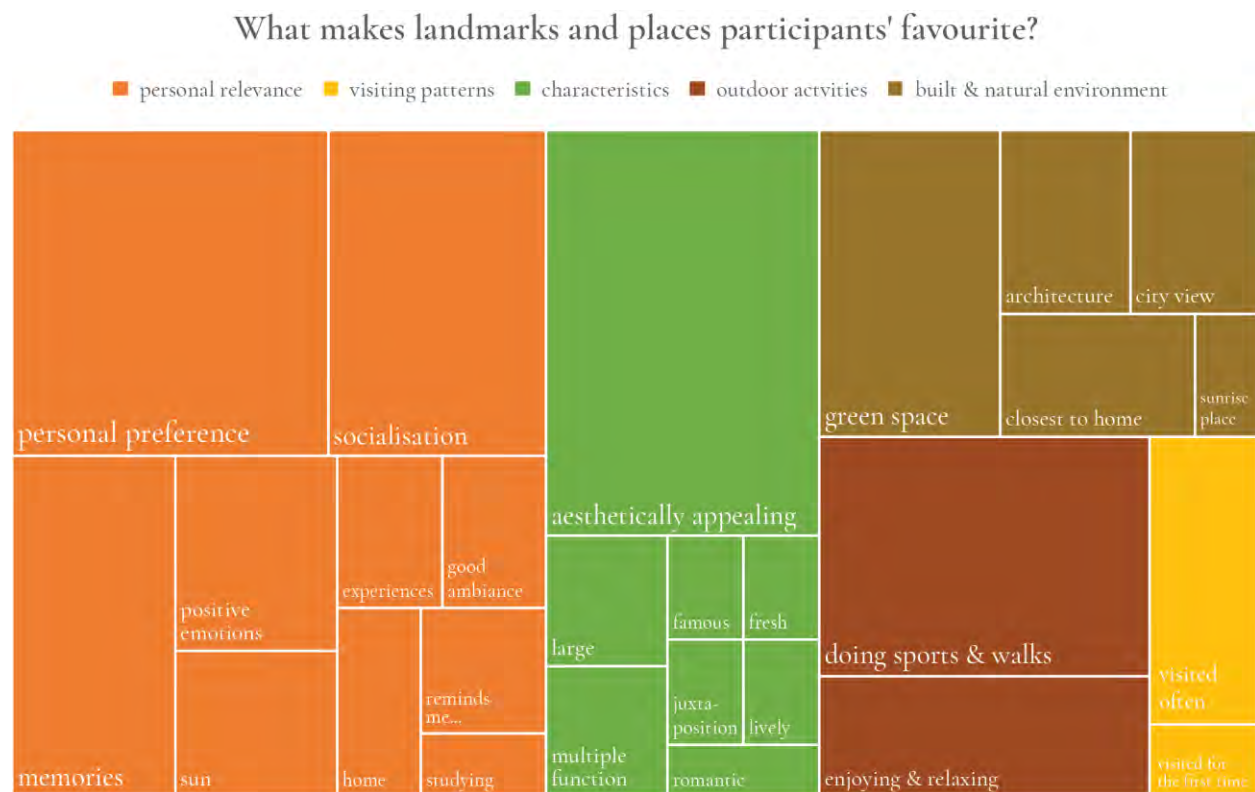


Figure 4.15: The reasons that make landmarks and places favourite.

When comparing associative landmarks of Vienna to favourite places, there is a significant decrease in the proportion of categories *landmarks & buildings* and *art & culture*. The number of single elements is increasing in the categories of *parks & nature*, *urban environment*, and *river & surroundings*, which makes them more diverse in terms of elements per category and related associations. The leading position is taken over by *river & surroundings* both in terms of frequency of category and of the landmarks per category. It includes the most often mentioned favourite landmarks, *Donauinsel* followed by *Donaukanal*, and *Donau*. Based on the responses of the students, these places are their favourite because of personal relevance (socialisation with friends, memories, personal preferences, associations, positive emotions, etc.), opportunities for outdoor activities (doing sports and walks, enjoying open spaces), characteristics (beautiful, romantic, lively), and natural

environment (green space). The following favourite places are *Schönbrunn*, *Belvedere*, and *Hofburg* (categorised as *landmarks & buildings*), and *Karlsplatz* and *Altstadt* (classified as the *urban environment*). In addition to personal relevance (memories, personal preferences, and socialisation) and visiting patterns (often visited), the characteristics of landmarks (such as positive visual qualities and juxtaposition, i.e. contrasting and combined nature) are also important. There is an interesting trend in the group of favourite places, in comparison to associative landmarks, the proportion of categories *urban environment* and *parks & nature* are increasing significantly. The reason for this is that they are directly related to personal experiences, memories, and free-time activities, which are valuable and mark these places amongst the most favourite. Moreover, the most frequently mentioned favourite places are mainly open-access areas.

Important landmarks and places

Along with the associated landmarks of Vienna and favourite places, students were also asked to name the place which was important to them and explain why was it important. From 26 students, 20 place names were collected which were classified in the categories of *landmarks & buildings*, *art & culture*, *urban environment*, *parks & nature*, *river & surroundings*, and *other*. The important places which were named more than once were 39% of all places. Among them, half were in the category of *landmarks & buildings* (*Hofburg* and *TUW*) and another half in *river & surroundings* (*Donau* and *Donauinsel*). The leading important places were *Hofburg* and *Donau* (three times each), followed by *TUW* and *Donauinsel* (two times each). All other places were mentioned only once. The places represented in the category *art & culture* (*Naschmarkt*, *Pinatore*, *Das Loft*) were solely gastronomic. The category *urban environment* included only one (*Karlsplatz*) and *parks & nature* two (*Auqraten* and *Türkenschanzpark*) landmarks. The biggest category was *other* which only includes homes, consisting of 27% of all named important places (Figure 4.16).

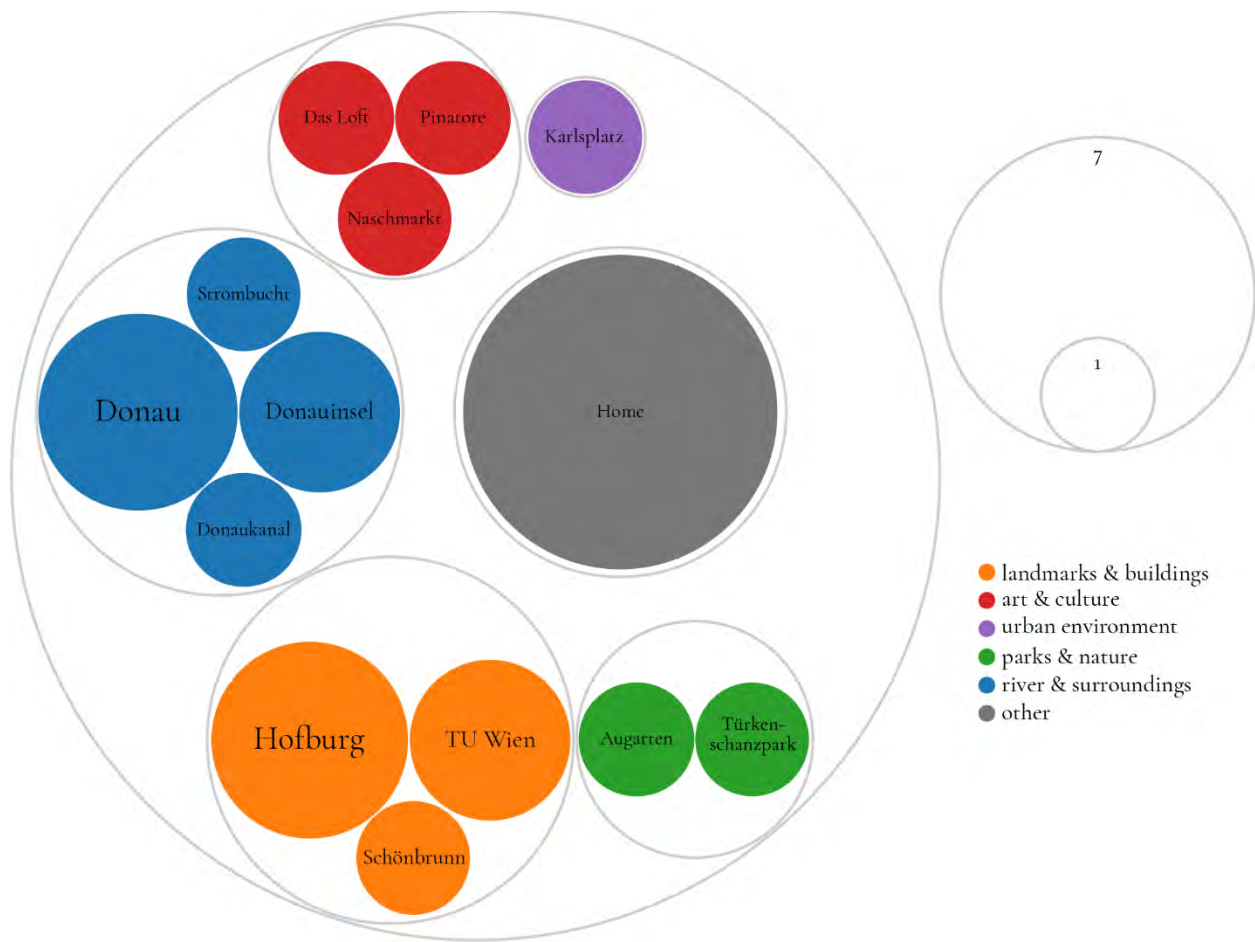


Figure 4.16: Important landmarks and places in Vienna.

By the frequency of the landmarks per category, *other* (35%) is leading, followed by *river & surroundings* (20%). The categories *art & culture* and *landmarks & buildings* are represented with the same number of elements (15% each). They are followed by *parks & nature* (10%) and *urban environment* (5%). In terms of the frequency of each category, i.e. the total number of landmarks which they include, distribution stays very similar to the previously described frequency. Categories *other* and *river & surroundings* (27% each) are staying at the leading positions and are followed by *landmarks & buildings* (23%). The last three categories are *art & culture* (11%), *parks & nature* (8%) and *urban environment* (4%).

After naming the important places, respondents were also asked to give a brief explanation of why they considered those places as important. These responses were grouped into the following categories: *personal relevance*, *visiting patterns*, *characteristics*, *outdoor activities*, and *built & natural environment*. The leading category, *personal relevance* (53%), demonstrates why a place is important. Among this group, the most significant factor is home and home feeling (40% within the category), followed by memories (15%), personal preferences and the study-related reason (10% each). The second important category is *built & natural environment* (18%), where the

vicinity (42% within the category), namely locations near the home, and green spaces (28% within the category) also played an important role. Next is *outdoor activities* (16%), which is mainly represented by sports and physical activities (83% within the category). *Visiting patterns* (11%) also has an influence on shaping important places, especially if the place is visited first time (50% within the category). The category *characteristics* (3%) had the least impact and includes only one response – *inspirational* (Figure 4.17).

What makes landmarks and places important for the participants?

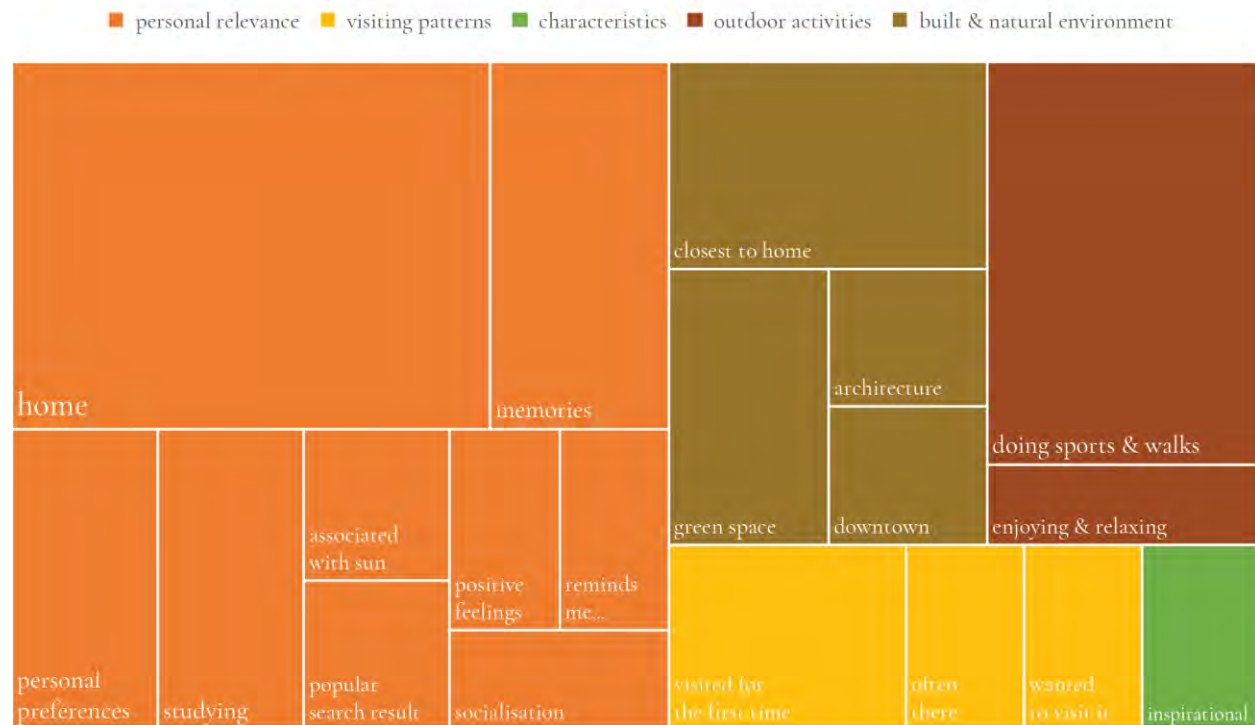


Figure 4.17: The reasons that make landmarks and places important.

Taking into account the findings of the study, the most important places for the respondents are their homes. Home is something personal and therefore important. Furthermore, it is an integrated part of daily life, where people spend the most time. Excluding homes, the significantly important places (with the highest frequency) are *Hofburg*, *Donau*, *Donauinsel*, and *TUW*. For *Hofburg*, the importance lies in personal preferences as well as its remarkable character (also promoted by media). In the case of *TUW*, personal experiences such as study reason and memories make it important. *Donau* and *Donauinsel* gain importance for the students due to the opportunities of doing outdoor activities, meeting with friends, good memories, and its relaxing surroundings. The high proportion of the elements from the category *river & surroundings* can also be explained in part for seasonal reasons. The summer semester gives students more opportunities to spend time outside, which affects the place preferences. If the dominant category of *other*, which includes home, is not taken into account, important places reveal similarities with the group of favourite places. For both, *river & surroundings* and *landmarks & buildings* are the most frequently cited categories, which are represented with similar features.

Emotional landmarks and places

During the interview session, students were asked what places in Vienna they felt the strongest emotional connection towards. The collected 24 emotional places were later grouped in the following categories: *landmarks & buildings*, *art & culture*, *urban environment*, *parks & nature*, *river & surroundings*, and *other*. Seven place names were mentioned more than once and consisted of 62% of all named places. Among them, most frequently mentioned were *Home* (32%), *Donau* (22%), *Donauinsel* (14%), *Donaukanal* (11%), *Schönbrunn*, *TUW* and *Friend's place* (7% each) (Figure 4.18).

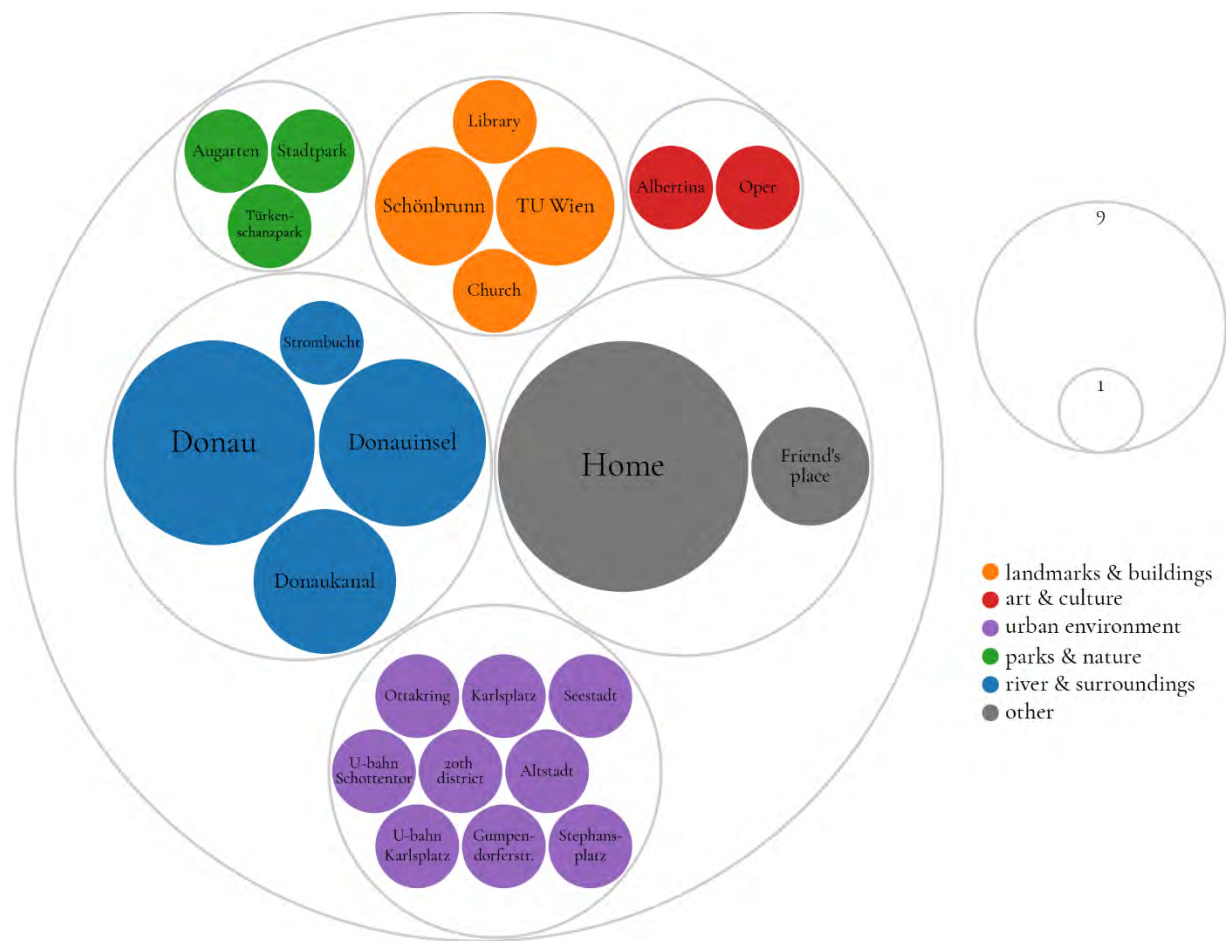


Figure 4.18: Emotional landmarks and places in Vienna.

Taking the frequency of landmarks per category, i.e. the number of landmarks named within the category, *urban environment* (42%) is significantly in the lead, followed by *landmarks & buildings* (16%), *river & surroundings* and *parks & nature* (13% each), and *art & culture* and *other* (8% each). In terms of the total frequency of terms amongst the various categories, the rankings are ordered as follows: *river & surroundings* (29%), followed by *other* (25%) and *urban environment* (22%). The least frequently cited are *parks & nature* (7%) and *art & culture* (4%).

The students were also asked to name what kind of emotional connection they had to their selected places. In the study, 29 expressions of emotions were collected (Figure 4.19). Among them, nearly half (48%) were mentioned more than once. The most frequently mentioned words which show the emotional connection to the places are: *positive* (nine times), *home feeling* (seven times), *happy* and *joy* (six times each), and *pleased* (three times).



Figure 4.19: Word cloud showing the emotions which connect people to the places.

Collected emotions were placed on the two-dimensional structure of emotions (Watson & Tellegen, 1985). The model is based on high and low positive and negative affect. It also takes into account both strong engagement/disengagement and pleasantness/unpleasantness. The majority of words (78%) describing participants' emotional connection to the places were clustered around the axes of *Pleasantness*. Namely, *Pleasantness* (28% of all words), *High positive affect* (19%), *Low negative affect/pleasantness* (17%), and *Low negative affect* (14%). Other words were distributed in the bottom-left quarter - *Low negative affect/disengagement* (6%) and *Disengagement* (5%). The remaining emotional words were presented at the upper part of the structure: *Pleasantness/high positive affect*, *Strong engagement*, and *High positive affect/strong engagement* (3% each). One word (2%) falls into the centre - *Neutral* (Figure 4.20).

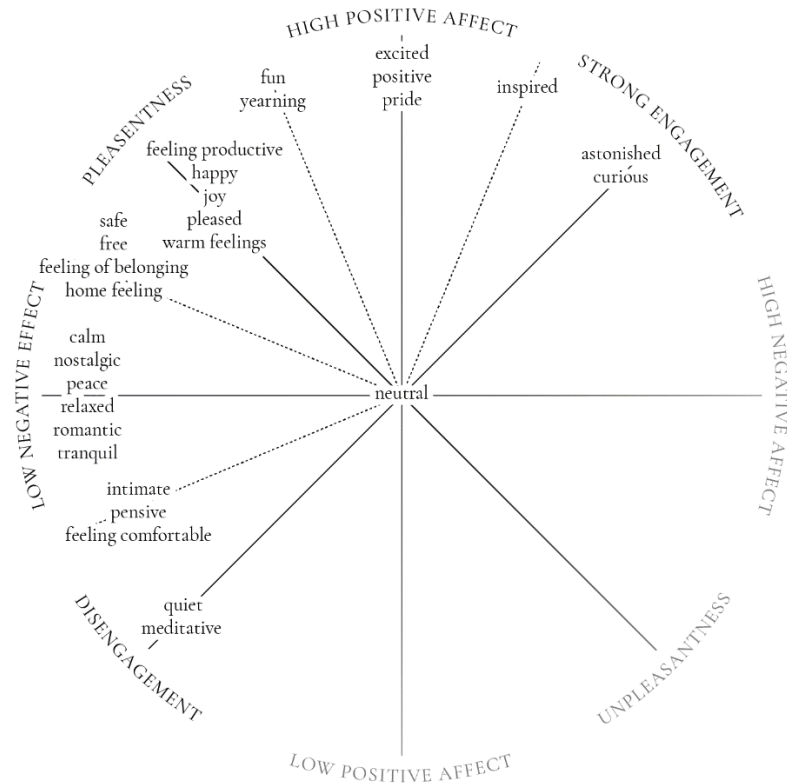


Figure 4.20: Words describing emotions placed on the two-dimensional structure of emotions.

After the participants described the emotions which were connecting them to the places, they were then asked to explain why they were associating these emotions with those places. In total, 23 different reasons were collected. Nearly half of them (44%) were named more than once. The most frequently mentioned reasons were: *leaving there* (eight times), *meeting friends* (six times), *sun* and *memories* (four times each), *often being there* and *friend's home* (three times each). Given answers were grouped in the following categories: *associations & memories*, *belonging & familiarity*, *outdoor activities & nature*, *personal preferences & importance*, *positive visuals*, and *socialisation*. The leading category that shows why students associate their emotions to particular places is *belonging & familiarity* (26%), where the living aspect is most important (62% within the category). The next categories are *socialisation* (22%), which includes friend's places and gathering places, *associations & memories* (20%), and *personal preferences & importance* (16%). The last groups of factors creating a connection between the emotions and places are *outdoor activities & nature* (10%) and *positive visuals* (6%), such as attractive, impressive, and beautiful (Figure 4.21).

Why do respondents associate their emotions to particular landmarks and places?

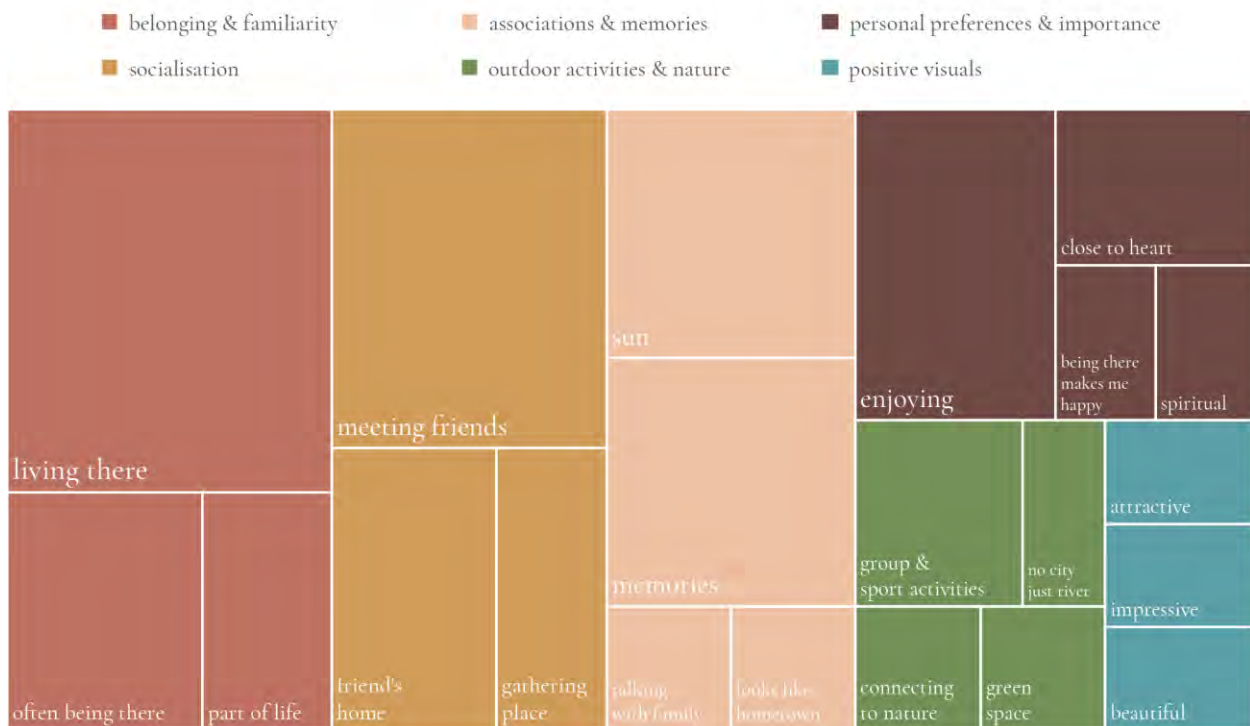


Figure 4.21: The reasons that make emotions associate with particular places.

One of the important aims of the study is to find out the significant emotional landmarks/places in Vienna and the connection which people have to them. The results reveal that respondents were most emotionally connected to their *homes*, which shows similarities with important places. For both of them, homes are the most meaningful and attached to emotions. These home-related emotions are so-called home feeling, feeling of belonging, joy, warm feelings and a feeling of safety. In the same category, in addition to *homes*, *friend's places* are also represented attached with positive and happy feelings. Next to the homes, a couple of students also referred to the districts where they lived and which were associated with similar home-related feelings.

In addition to homes, most emotional landmarks are the features that are related to the river and its surroundings, such as *Donau*, *Donauinsel*, and *Donaukanal*. Here a parallel can be made not only with important but with favourite places as well. In each case, positive experiences, memories, associations, and emotions that respondents have towards the river area play an important role and make this group of landmarks/places prominent. *Donau*, *Donauinsel*, and *Donaukanal* are related to positive emotions, happiness, fun, and joy. Next to these emotions ranging from high positive affect to pleasantness, students also named the emotions such as meditative, romantic and peaceful. All these emotions fall between the low negative affect and disengagement. Moreover, for the respondents, the river and its surroundings also evoke emotions like being inspired, which falls between high positive affect and strong engagement. All these emotions are triggered by associations and memories which respondents hold towards those places. Furthermore, socialisation, outdoor activities, and

personal preferences also play a significant role in forming emotions. Taking into account this wide range of emotions that people are connecting with the river and its surroundings, it is obvious why this category is so prominent.

From the landmarks, most emotional characters showed *Schönbrunn* and *TUW* (from the category of *landmarks & buildings*). Other landmarks were *Oper*, *Albertina* (both categorised as *art & culture*), *Stephansdom* and *TUW library* (from the category *landmarks & buildings*). For *Schönbrunn*, *Oper*, and *Albertina* emotions were described as excited, astonished, pride, pleased, and yearning. All of them express high positive affect and pleasantness, which is triggered by the visual qualities of the buildings (such as attractiveness and impressiveness). These landmarks are also presented in the group of important (however only *Schönbrunn* is presented here from the given landmarks) and favourite places. The presence of the same landmarks and places in each of these groups is related to the positive feelings, associations and personal preferences, daily routine and visual properties of the buildings. Emotions related to *TUW* are described as positive, happy, and pride which are also part of pleasantness and high positive affect. In this case, this emotional connection is not evoked by the visual properties of the building but by the feeling of belonging to it. As the respondents were students, *TUW* was the main reason for them being in Vienna and it played an integral part of their lives. Therefore, *TUW* can be found with the same proportion in the group of important places as well. The landmark *Stephansdom* is related to pensive emotions, which is between the low negative affect and disengagement, whereas *TUW library* is connected to the feeling of being productive (pleasantness) or just a neutral feeling, which was the only emotion from its type.

The category *parks & nature* is very similar in terms of the emotions to the *river & surroundings*. The emotions attached to those places are positive, happy, and relaxed. All these are evoked by associations & memories, socialisation, familiarity and being close to nature.

From the category *urban environment*, a notable portion of districts is remarkable. Some of them are the parts of the city where respondents are living and therefore related to feelings such as home feeling, safe, and calm. All of them belong to either low negative affect or pleasantness. From other districts, *Altstadt* is represented with emotion types of curious, inspired, and nostalgic, which are spread in a wide range from strong engagement, high positive affect/strong engagement, and low negative affect. In addition to the districts, squares such as *Karlsplatz* and *Stephansplatz* are also presented. Respondents related those places to a feeling of comfort and positiveness which was caused by familiarity with a place and associations to their home town. Interestingly, from this category, one street (due to a friend's home, this street evokes pleased emotions), two transport features related to warm feelings (because of familiarity), and joy (caused by personal preferences) were named.

As seen, the emotional landmarks of Vienna are not from one single category, but they show a variety. They have a wide range from homes of people and natural features to landmarks. However, all of them have one similarity: they are associated with positive emotions of different intensities.

4.3.2 Emotions attached to the mental mapping process

Positive and negative affects

The positive and negative affect schedule is a mood scale that includes 20 words describing different feelings and emotions (Watson et al., 1988). During the first and second user studies, respondents were asked to rate given words from 1 (*very slightly or not at all*) to 5 (*extremely*) to indicate the extent of their feelings and emotions at the present moment. In this section, from the 20 initial adjectives, four will be discussed and illustrated. This selection is based on the one hand on the context and focus of the user studies, on the other hand, insights of the obtained results. The selected adjectives are *interested*, *inspired*, *excited*, and *nervous*. The first three represent positive affects and the last negative.

In the first user study, mood scale responses were collected from 25 participants. The results reveal that the *interest* level of the respondents has significantly increased after the virtual 'Vienna city walk'. Before the event proportion of those students who indicated that they were *quite a bit* (36%) and *moderately* (24%) *interested* increased after the event and reached 64% and 36%, respectively. The extent of *inspiration* has also increased; namely, the proportion of those indicating being *quite a bit inspired* grew six times after the event and reached 24%. In addition, over half of the respondents rated *moderately inspired* both before and after the virtual 'Vienna city walk'. The last positive affect discussed here is *excitement*, which also revealed an increase in the proportion of those who rated being *quite a bit excited* before and after the virtual 'Vienna city walk', 40% and 60% respectively. Moreover, after the event, there was nobody who indicated *very little excitement*. Feeling *nervous* was present at different levels. However, before the virtual 'Vienna city walk', 20% of students did not give the answer. The number of those students increased after the event and reached 36%. Of those, who rated this emotion, 44% and 36% stated that they were *very slightly or not at all nervous* before and after the event, respectively. After virtual 'Vienna city walk', nobody indicated that they were *extremely nervous* (Figure 4.22).

In the second user study, responses of 26 participants regarding the extent of their feelings and emotions showed quite similar trends to the first user study. Here as well, the intensity of positive affects increased after the on-site 'Vienna city walk', whereas negative affect reduced. The proportion of the participants who stated that they were *quite a bit* and *extremely interested* was over 92% before and 96% after the walk. Even though the general ratio did not change significantly, those who stated *interest* level as *extreme* has increased from 19% to 35%. The same tendency is seen for *inspiration*. Before the 'Vienna city walk', half of the participants felt being *quite a bit* and *extremely inspired*. After the walk, this proportion increased and reached 76%. In addition, the ratio of being *extremely inspired* increased nearly four times (from 7% to 27%). *Excitement* before and after the walk shows a more stable character, with 58% and 62% of students stating being *quite a bit* inspired, respectively. The negative affect, such as being *nervous*, was not significant during the second user study. Before the 'Vienna city walk', more than half of the respondents stated that they felt *very slightly or not at all* (58%) and *a little* (31%) *nervous*. After the walk, fewer people felt nervous; they evaluated their level of being nervous as *very slightly or not at all* (85%) and *a little* (12%).

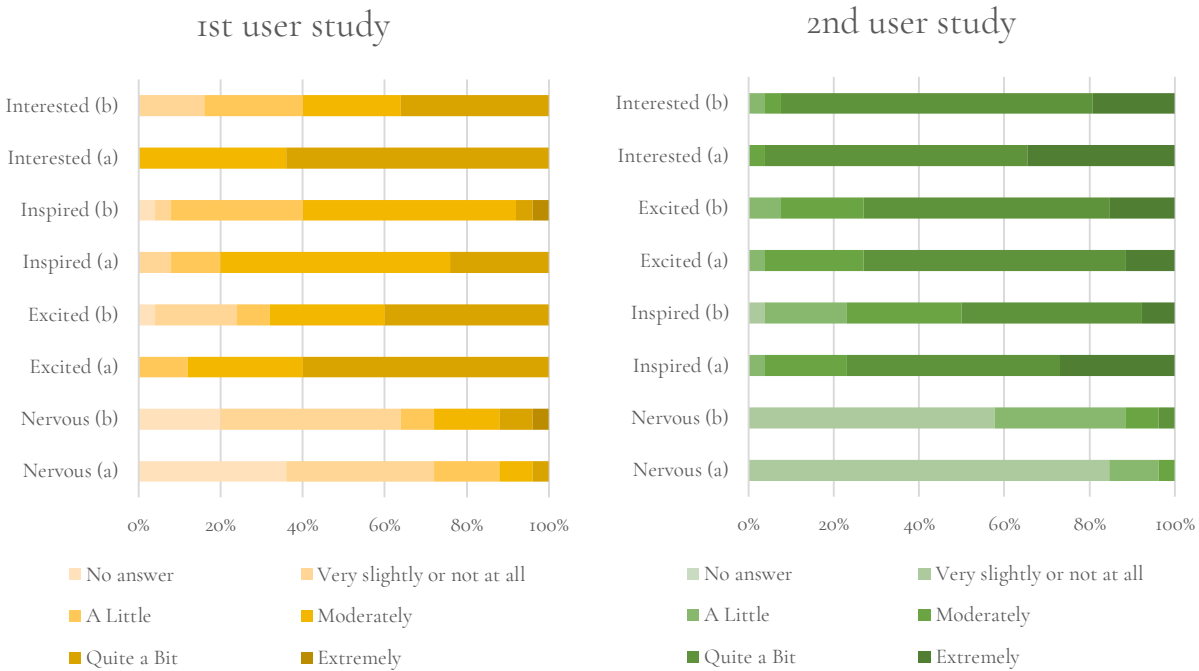


Figure 4.22: Positive and negative affect mood scale (PANAS) before (b) and after (a) the 'Vienna city walk' represented by selected words.

To conclude, positive affects become stronger after the virtual and on-site 'Vienna city walk'. There was a slight presence of extreme feelings in the first user study, only one case for being *extremely inspired* and *nervous* before the event. In contrast, this group of answers is one of the most frequently indicated in the second user study. Moreover, regarding positive affects, none of the respondents rated *very slightly or not at all*. The reason for it can be an on-site experience that evokes stronger emotions than the virtual one. In the case of the negative affect, nobody stated being *extremely* and *quite a bit nervous* during the second user study, as students might already have a general impression about the study setting from the first user study. After the event, indicated stress level has decreased even more. *Excitement* shows a more significant increase in the first user study. This can be explained by getting acquainted with the new place where respondents would move, which triggered stronger emotional responses. After gaining living experiences and becoming familiar with the city, there is no significant difference between the excitement levels indicated before and after the walk. However, in both user studies, *interest* and *inspiration* are notably increasing after the walk.

Emotions experienced and reflected in mental maps

At the end of the interview, participants were asked about the role of emotion in creating both their first and second mental maps. In the case of the first mental maps, 75% of participants stated that emotions played a role in the mental mapping process. For the second mental maps, this proportion increased and reached 100%, i.e. all 24 participants shared this opinion. In the case of saying yes, students were asked to name the emotion

they were experiencing. These emotion-expressing words (25 words in each user study) were later grouped into categories.

The emotions relating to the first mental map were very evenly distributed between the categories: *pleasantness* (24%), *excitement*, *anticipation* and *neutral* (20% each), as well as *unpleasantness* (16%). Most words referenced pleasant feelings such as positive, feeling good, and amicable. They were followed by the emotions showing excitement (about the new place, Vienna) and anticipation (expectations and looking forward to moving to Vienna). Next to the positive emotions there were also *neutral* (being serious or generally neutral) and *unpleasant* ones, such as having study-related worries, being stressed or afraid (Figure 4.23).

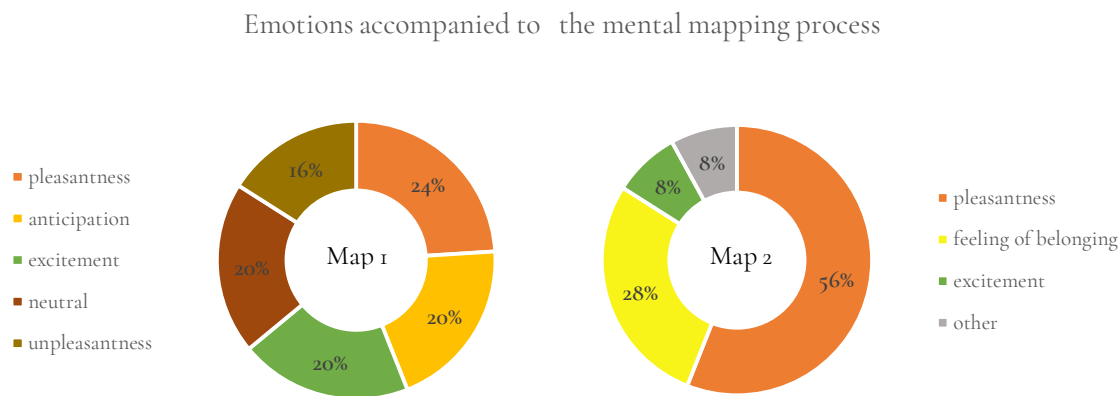


Figure 4.23: Emotions experienced during the mental mapping process.

The emotions accompanying the second mental mapping activity were mainly from the category *pleasantness* (56%), such as positive, happy, enjoying the process, good mood, and calm. In addition, a group *feeling of belonging* (28%) appeared, which resulted in creating the mental maps more personalised by including the elements of personal relevance. *Excitement* and *other* (8% each) included delightful and deeply emotional feelings of respondents, respectively.

Asking about the role of emotions which they played in creating mental maps revealed that emotions have a significant impact on the process. Furthermore, participants named different emotions which they were experiencing during the process and were reflected in their mental maps. From those referred emotions, *pleasantness* and *excitement* are presented both for the first and second mental maps. *Anticipation*, which was named in the first mental mapping session, was later replaced by the *feeling of belonging*, which resulted in making second mental maps more personal (including items of personal relevance). Neutral and unpleasant feelings also disappeared in the second mental mapping. Moreover, students noted that positive emotions motivated them to draw and the process, revealed a deeply emotional character.

Enjoyable and challenging parts of mental mapping

After the mental mapping session, participants were asked about what they enjoyed the most while creating a mental map, on the one hand, and what was the most difficult parts of it, on the other. Their responses were then classified into different categories. The most enjoyable part of the mental mapping was named the *drawing process* (38%), which includes the hand-drawing action, interacting with colours, expressing thoughts, using imagination, and being creative. The next was the category *recalling/reflecting on memories* which contains answers about memories, reflecting recently gained information from the virtual ‘Vienna city walk’, etc. Drawing mental maps were also evaluated as a fun and relaxing activity. In addition, while mental mapping, students enjoyed *being excited* and *feeling free* (18% each). The former mainly included excitement related to getting to know insights about the city where they were going to move. In the latter, respondents noted that they enjoyed feeling free and having no pressure (Figure 4.24).

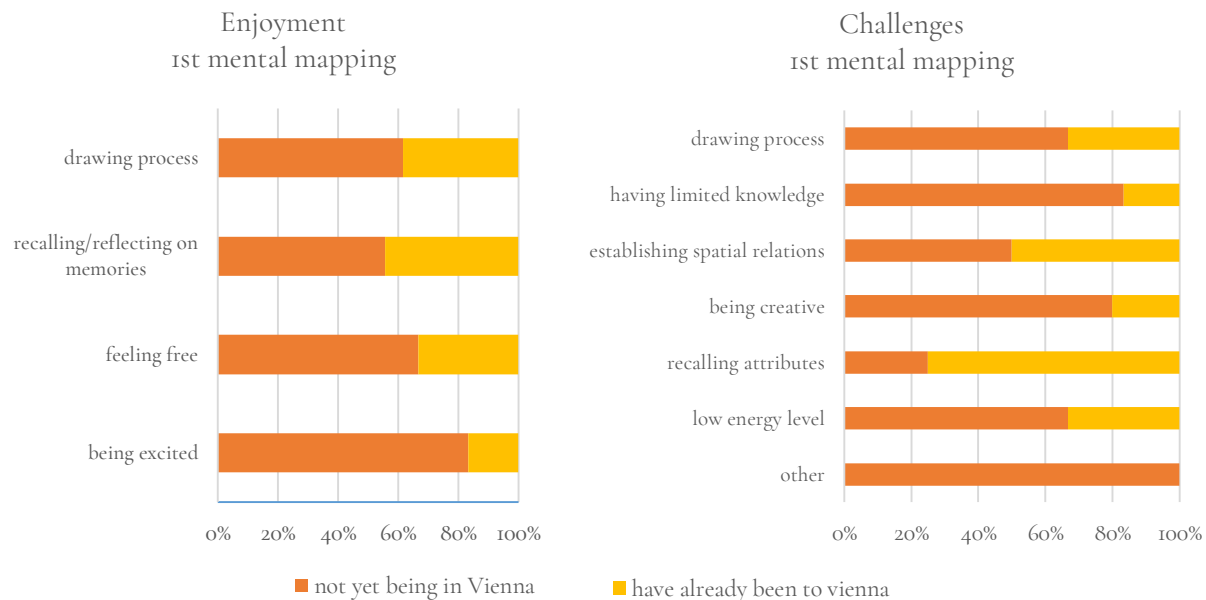


Figure 4.24: The most enjoyable and challenging parts of the 1st mental mapping process.

The categories which combine responses of students about the challenging parts of creating a mental map are more diverse. However, here as well, *drawing process* (26%) is in the lead, due to the difficulty of drawing actual shapes of features, symbolisation, visualisation of thoughts, and designing the layout. Other groups of reasons which felt difficult for the students while mental mapping were *having limited knowledge* (18%) and *establishing spatial relations* (17%). The former category combined the responses which deemed their background knowledge about Vienna insufficient. The latter included difficulty in remembering locations of specific features and a general lack of spatial memory. In addition, respondents named *being creative* (15%) and *recalling attributes* (12%), i.e. recalling places and their names, as one of the hardest parts of the mental mapping process. Some students also mentioned having a *low energy level* (9%) and being tired by the time of the first user study.

Before conducting the first user study, some respondents (nine students) had already been to Vienna. Taking this into account and looking once again at the results about the enjoyable and hardest parts of mental mapping, shows some interesting insights. The students, who had never been to Vienna before, experienced more excitement (80%) while drawing, than those, who had already been to the city, as it was not their first-time experience of getting to know Vienna. About half of the respondents who enjoyed *recalling/reflecting on memories* were those who had already been to the city and had personal experiences and memories related to it. In the case of the difficult aspects of mental mapping, those who already had been to Vienna found *recalling attributes* challenging, as they already had more background knowledge and therefore tried to recall more details; whereas students who had never visited the place mostly named *having limited knowledge* as one of the most difficult parts of the mental mapping process.

At the end of the second user study, students created their second mental maps of Vienna. Then they were asked the same questions as in the first user study to name the most enjoyable and the most difficult parts of the mental mapping process (Figure 4.25). Of the most enjoyable aspects of mental mapping, *drawing process* (35%) represented a significant portion, i.e. enjoying visualising thoughts, emotions, and visited places, using colours, etc. *Recalling memories* (23%) and looking back at the experiences was also named as a pleasant factor of the mapping process. A high proportion of the category *knowledge gain* (21%) shows that ‘Vienna city walk’ has positively contributed to the mental mapping. In addition, words falling under the category of *linking places & associations* were also identified as enjoyable. This category included making connections between the city walk components and own experiences, thinking about the specific places, attached associations/memories or places which students wished to visit.

Over half of the reasons which were named as the most difficult parts of mental mapping are about the *drawing process* (58%), such as drawing original shapes of features, making drawing recognisable, drawing specific items, visualising feelings, etc. Some respondents evaluated their drawing skills as being insufficient. They also referred to resource limitations, such as the space for drawing, not being able to edit already drawn elements, as well as a time factor. The next most significant challenging factor of mental mapping is the category of *establishing spatial relations* (34%), which includes difficulties in orienting oneself and situating landmarks, connecting different parts of the map together, and positioning the various features. Remembering place names or other details, represented by the category *recalling attributes* (8%), was the least mentioned category of difficult factors of mental mapping.

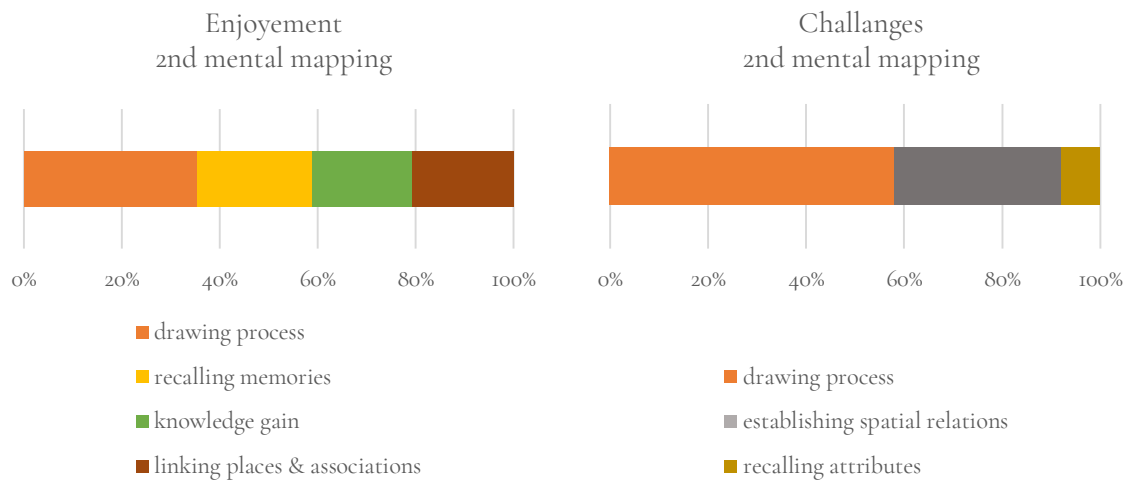


Figure 4.25: The most enjoyable and challenging parts of the 2nd mental mapping process.

Comparing the results of both user studies, students considered the drawing process itself not only the most enjoyable but also the hardest part of the mental mapping. On the one hand, interacting with colours and expressing visualised images in a hand-drawn manner remains as the most pleasing, on the other hand, visualising thoughts and emotions, drawing recognisable elements, and creating a desired layout remains challenging. Before visiting the place, excitement plays a significant role, which is directly reflected in the positive aspects of the mapping process. Positive mood accompanied to the mapping process was also observed by the interviewer during both mental mapping processes. After visiting the place, as respondents were already familiar with the city, excitement is replaced by enjoyment in linking the places with their associations. Recalling and reflecting on memories remains an important positive aspect of the mental mapping. The difference between the first and second mental mapping activities is that for the former, the feeling of being free was present. This can be explained by participants acquainting themselves with the mental mapping process which does not have any particular constraints, but rather gives a wide range of opportunities to express mental images. Whereas for the latter, students were already familiar with the concept of mental mapping and therefore this aspect did not appear amongst the most pleasing components of the process. However, in the case of the second mental mapping session, knowledge gain played an important positive role, which is largely related to the on-site experience of the 'Vienna city walk'. Another difference between the results of the sessions of mental mapping is the number of categories expressing the hardest parts of the process. The number of challenging categories was reduced in the second session. This can be explained by the fact that during the first user study, students were fairly unfamiliar with both the mental mapping activity and the mapped place, Vienna.

4.3.3 Similarities and differences

Explanations given by participants to their mental maps

In the interview sessions, participants were presented with the first and second mental maps which they drew and asked to describe the main similarities and differences between them. Analysing and classifying their answers revealed two main groups of similarities, namely *features* and *map elements*, and five smaller groups of differences, related to *selection of elements*, *scale & extent*, *accuracy & details*, *personalisation*, and *representation*.

Concerning similarities, the group of *features* combines different landmarks and places which students included both in their first and second mental maps. All landmark categories used in this study (*landmarks & buildings*, *art & culture*, *urban environment*, *parks & nature*, *river & surroundings*, and *other*), were equally represented within this group of *features* by the following elements: museums, river, university, churches, main streets and transportation, districts and homes. Another rather smaller group of *map elements* included map-related components such as labels, symbols, texturing, extent, and layout (Figure 4.26).

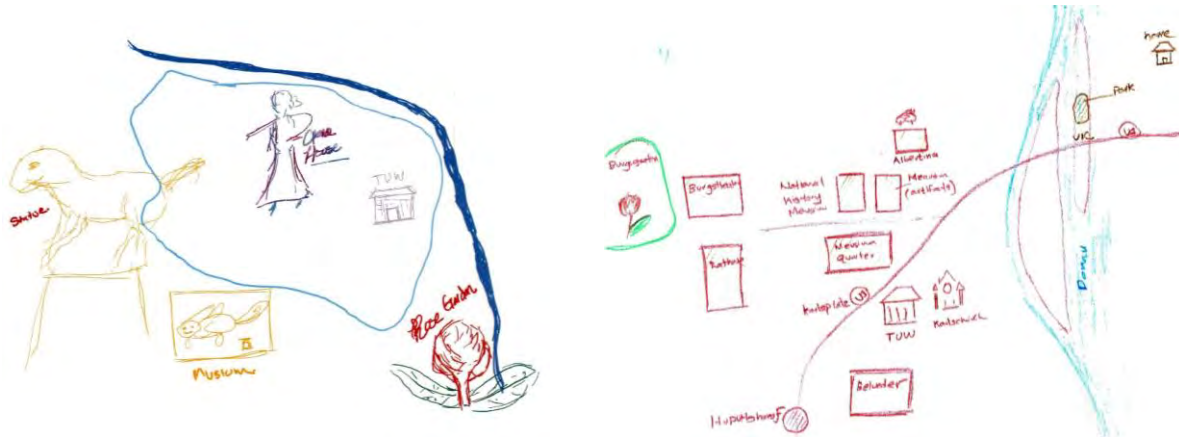


Figure 4.26: The first (left) and second (right) mental maps of respondent 10.

In the case of differences between the mental maps, most participants referenced to *selection of elements*; namely, they visualised more landmarks and included more elements in their second mental maps. Another big group showing differences was *representation*, which comprises colour choice, usage of point or line symbols, and variation in labelling. The aspect of *personalisation* became important for the second mental maps, where students included more personal experiences, associations and emotions, as well as their and friend's houses. Between some maps, *scale & extent* of the mapped area has also changed, as well as *accuracy & details*, i.e. level of details of the map (Figure 4.27).

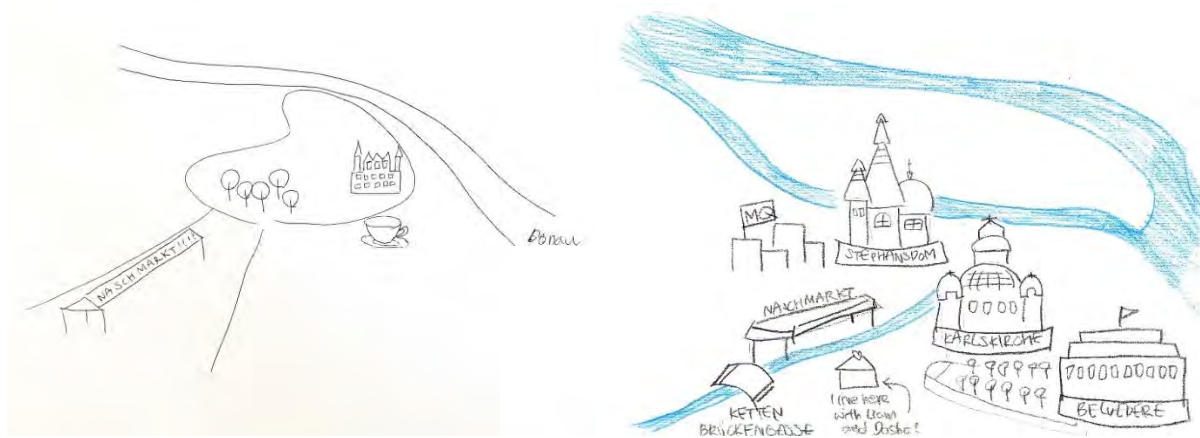


Figure 4.27: The first (left) and second (right) mental maps of respondent 20.

It is important to see how students evaluate their mental maps and what kind of interpretations they give to them. The group of similarities include a set of *features* and *map elements*. *Features* are abstracted and rarely include any specific and concrete place or landmark names. It represents features in a generalised way, such as a museum, church, river, street. The group of similarities show mainly the elements of the first mental maps, which are still presented in the second mental maps. Therefore, descriptions are quite broad, with very few concrete landmarks or place names. The second group of similarities, *map elements*, comprise the elements which are used in the mapping.

Compared to similarities, it is the differences between two mental maps that reveal more details. These differences illustrate what distinguishes mental maps, which are drawn before and after visiting the place, from one another. In the differences, in addition to *selection of elements* (mainly caused by gaining new experiences) and *personalisation* (shows a stronger emotional connection to places), discipline-specific map components are also highlighted, such as *scale & extent*, *accuracy & details*, and ways of *visualisation*. The presence of these categories can be explained by the fact that the respondents were from the field of cartography.

Mental map elements

The mental maps have been broken down into the consisting elements for further analysis. From 700 unique elements, the first mental maps combined 269 and the second mental maps 431 elements. Each of those elements was grouped into the categories and their corresponding types given in the Table 4.4.

Landmarks & Buildings					
Palace	Church	Churches generic	University	Building	Statue
Art & Culture					
Performing arts	Museum	Arts generic	Gastronomy	Shop	
Urban Environment					
Square	Transport	Street	Streets generic	District	
Parks & Nature					
Park	Parks generic	Nature	Nature generic		
River & Surroundings					
River	Channel	Island			
Other					
Homes	Map elements & symbols	Activities	Thoughts & expectations	Memories & experiences	Directions

Table 4.4: Categories and their corresponding types used to classify mental map elements.

Over half of the elements of the first mental maps were classified under the category *other* (64%). They include thoughts and expectations (*sun, coffee, adventures*, etc.) about Vienna, own or friends' homes, and map elements and symbols, such as title and north arrow. The next category is *urban environment* (53%), which mainly includes different parts of the city, such as *Altstadt* and other districts (represented with numbering), transportation (*Train- and U-Bahn* stations and lines), and the main or minor streets. *Art & culture* and *landmarks & buildings* (19% each) have the same proportion of elements in the first mental maps. The former combines art- and culture-related features, museums (such as *Albertina* and *Museumsquartier*), venues of performing arts (*Oper* and *Musikverein*), gastronomical areas (*Naschmarkt*), and shopping stores. The latter category combines *TUW*, churches (*Stephansdom, Karlskirche*, and in general churches), palaces (*Schönbrunn, Belvedere*, and *Hofburg*), and other buildings (such as *Rathaus*). The category of *river & surroundings* (12%) is presented by the river (*Donau*) and channel (*Donaukanal*). In the end, *parks & nature* (6%) mainly includes parks (mostly those without names, as well as *Volksgarten* and *Prater*) and natural elements such as forest and hills (Figure 4.28).

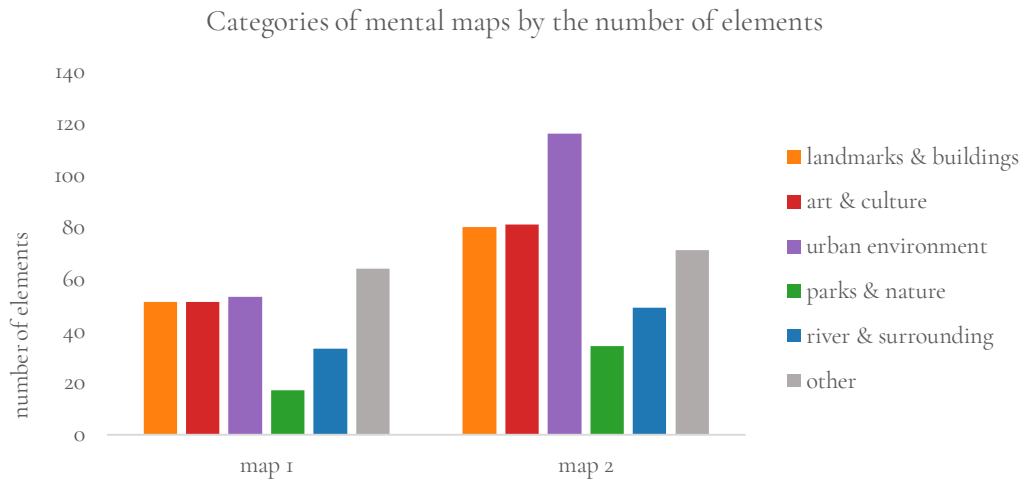


Figure 4.28: Elements of mental maps classified into categories.

Looking at the features of the first mental maps (frequency of appearance of each element) reveals an image largely based on positive expectations about the future living place and activities. Most of the first mental images are organised around the city centre (*Altstadt*). The structure of the city is defined by the river and channel, borders of districts, and transport routes. Own or friends' places also play an important role. The presence of the *TUW* in the mental maps is remarkable, as it is considered the main reason for moving to Vienna. The first mental maps of Vienna, which are drawn before visiting the place, already show a strong art- and culture-related character, which is represented by including different art-related venues and famous landmarks such as prominent churches and palaces. A considerable number of elements of the first mental maps are generalised, i.e. not indicating proper names of places or relative locations, such as museums, music, parks, churches, buildings. This can be explained by not being familiar with the place yet, however still including the elements which are reflecting knowledge about Vienna and associations and expectations towards the city, which at the end shape the mental image of the place.

In the case of the second mental maps, the frequency of the category *urban environment* (27%) is the highest. This category is in the lead due to the high portion of transport-related elements (different train stations, *U-Bahn* lines, etc.), followed by the thirteen different districts, streets (*Ring* and other streets), and squares, such as Karlsplatz. The next categories are *art & culture* and *landmarks & buildings* (19% each). The former includes mainly museums (*Albertina*, *Museumsquartier*, *Kunsthistorisches* and *Natrhistorisches Museum*, etc.), venues of performing arts (*Oper*, *Musikverein*, *Burgtheater*) as well as gastronomic places, such as *Naschmarkt*. The latter comprises *TUW*, churches (*Stephansdom*, *Karlskirche*), and palaces (*Belvedere*, *Hofburg*, and *Schönbrunn*), as well as other buildings, such as *Rathaus*. The next category is *other* (16%) with memories and experiences (depicted with various labels; it also includes drawings of people), own or friend's homes, map elements and symbols (title, different symbols showing emotions, and legend), directions (showing the 'Vienna city walk' path, neighbouring cities and places), and sport-related activities. The last two categories with the frequency of

elements are *river & surroundings* (11%) and *parks & nature* (6%). The former includes the river (*Donau*), channel (*Donaukanal*), and island (*Donauinsel*). The latter comprises parks (*Stadtpark*, *Burggarten*, *Volkspark*, etc.) and nature, such as *Wienerwald* and *Kahlenberg*.

Based on the analysis of the frequency of depicted elements, the second mental maps also dominate with the urban environment-related elements, namely transportation. Their depiction shows a good familiarity of respondents with the city. The art- and culture-related image of Vienna is reflected in the mental maps of participants and are presented by museums and different art venues. Next to them, iconic landmarks such as churches and palaces are also remarkably presented. In the second mental maps, depicting the places related to the memories and experiences play especially a significant role. An increased presence of gastronomic places is also explained by personal experiences. In addition to various landmarks, the river and its surroundings, as well as parks are also notably present. Homes and districts remain represented in the mental maps. For the orientation, mental maps are enriched with different elements showing directions (path of the ‘Vienna city walk’), as well as other map elements and symbols.

Visualisation of mental map elements

The elements of mental maps were depicted differently by the students. In this study, the visualisation of the features is classified into the following groups: *geometric* (*g*), *pictogram* (*p*), and *text* (*t*). In this context, the term *geometric* refers to a generalised, simplified shape of a feature, whereas a *pictogram* is a symbol- or picture-like representation, which has a pictorial resemblance to a real-world object. Alternatively, *text* is used to depict objects in a written form.

While analysing the mental maps, each depicted element was classified under the above-mentioned forms of visualisation: *geometric*, *pictogram*, and *text*. The results reveal that in the first and second mental maps, visualisation with *text* (185 and 291 elements respectively) was the most frequently used method, followed by the groups of *geometric* (110 and 220 elements), and *pictogram* (185 and 158 elements), respectively. Each form of visualisation per category, *landmarks & buildings*, *art & culture*, *urban environment*, *river & surroundings*, and *other*, will be discussed below (Figure 4.29).

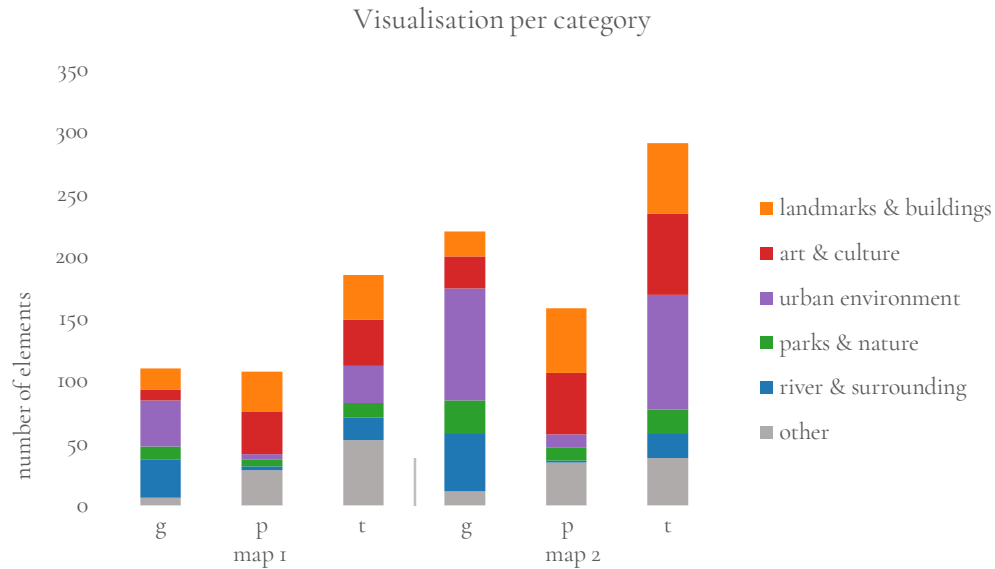


Figure 4.29. Map element visualisation (geometric (g), pictogram (p), and text (t)) and their distribution per category.

For both the first and the second mental maps, *geometric* depiction is mostly used for the elements, which are classified under the category of *urban environment*. They are the features such as districts, streets, and transportation. All these elements are depicted by the line symbols. Other linear features of this group of visualisation fall under the category *river & surroundings* which includes the river (Donau), channel (Donaukanal), and an island (Donauinsel, only in the case of the second mental maps). The next categories are *landmarks & buildings*, *art & culture*, and *parks & nature*. The elements of the first two categories that are mainly art-related venues and iconic landmarks of Vienna (including TUW) are symbolised by rectangles or building-like geometric shapes. In the case of *parks & nature*, areal shapes are used, which are coloured in green or given a pattern. *Geometric* visualisation is present in the category *other*. In this category, these visualisations are used to depict homes, directions (shown with arrows), and the path that represent the route (in the second mental maps).

Along with the *geometric* visualisations, *pictograms* are also frequently presented in the first as well as in the second mental maps. They are mainly used to depict the elements which are under the categories of *landmarks & buildings*, *art & culture*, and *other*. In the case of the first two categories, *pictograms* are used to make depicted features look like real-world objects. This is reached either by using more abstract and universally recognised symbols, for example for museums or music-related facilities (mainly seen in the first set of mental maps), adding drawn features remarkable details of the corresponding famous landmarks (Karlskirche, Stephansdom, Rathaus), and turning buildings into 3D from a simple 2D depiction (often seen in the second mental maps). In addition, *pictograms* were frequently used to depict gastronomic places (by drawing Sachertorte, Coffee, etc.) and statues. *Pictograms* were also used for TUW by drawing its logo in mental maps. For the category *other*, this way of visualisation was applied for homes, as well as for thoughts and expectations (sun, people, food,

studying, etc.) in the first mental maps, and memories and experiences (sports, people, barbeque, beer, etc.) in the second mental maps. They were also utilised to depict map elements (such as a north arrow and directional signs) and symbols with universally recognisable personal emotions (such as heart and emojis). In the case of *parks & nature*, *pictograms* were used for depicting natural features and to emphasise those parks that had memorable and distinguishable details (such as flowers shaped as musical notes in Burggarten, which was passed through during the on-site ‘Vienna city walk’). For the elements under the category *urban environment*, *pictograms* were employed to mainly show the U-Bahn symbols.

Text is the most often used from other visualisation methods due to its frequent presentation in combination with *geometric* elements and *pictograms*. *Text* is especially often presented in the category *other* to indicate homes, map elements and directions (mainly titles and place names), and in the case of the first mental maps thoughts and expectations about the future life in Vienna. In addition, in the second mental maps, *texts* illustrate memories and experiences given by labels showing associations or information related to landmarks and places (gained during the Vienna city walk). In the case of the categories *art & culture* and *landmarks & buildings*, *text* is used to indicate place and landmark names. The category *urban environment* in the second mental maps is the most text-heavy, due to the systematic labelling of U-Bahn lines, districts, and streets. The categories *river & surroundings* and *parks & nature* are less labelled, as here the shape and colour give more context to the features. However, less recognizable features such as Wiener Fluss or smaller parks are accompanied with text, to be identifiable.

Visualisation of landmarks and places of personal relevance

During the interview session, participants were asked whether some of their map elements were associative, favourite, important, or emotional for them. One map element could be in more than one category at the same time. In the first and second mental maps, the elements having a personal relevance were grouped as follows: associated 41 and 47, favourite 21 and 56, important 32 and 59, and emotional 16 and 31 elements, respectively. The number of all elements with personal relevance significantly increased between the first and second user studies, particularly emotional and favourite places, which at least doubled after gaining living experiences in Vienna. The number of important places also significantly increased, whereas associated remained quite stable (Figure 4.30).

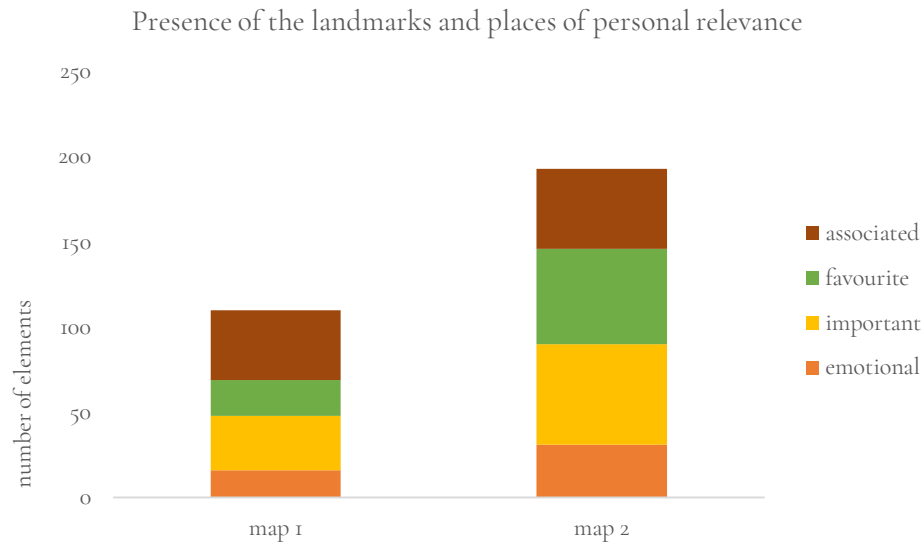


Figure 4.30: Frequency of the landmarks and places having personal relevance.

The map elements with personal relevance were visualised differently. They were classified into the groups of *geometric* (*g*), *pictogram* (*p*), and *text* (*t*) that were discussed in the previous section. The mental map elements which are associated with Vienna are mainly visualised by *pictograms* and *texts*. *Pictograms* are used for art- and culture-related places (*Oper* and *Museums*), landmarks (*Stephansdom*, *Karlskirche*, *TUW*), parks (such as *Burggarten*), as well as for the gastronomic (*Sachertorte*, *Naschmarkt*, etc.) places. They are also employed in combination with texts for thoughts and expectations (*sun*, *coffee*, etc.), activities (*sports*, *mapmaking*), memories and experiences (*people*, *barbeque*, and *beer*). *Texts* are also used in combination with graphical elements for the urban environment components, such as districts, and natural elements, such as a river and its surroundings. Favourite elements are mainly depicted by *geometric* shapes and *pictograms*. The former group is largely presented by the river and its surrounding (*Donau*, *Donaukanal*, *Donauinsel*), parks (*Burggarten*, *Türkenschanzenpark*), landmarks, such as *Belvedere*, and art and culture venues, such as *Museumsquartier*. *Pictograms* mainly include landmarks (*Stephansdom*, *Hofburg*, *TUW*), art and culture (*Albertina*, *Naturhistorisches* and *Kunsthistorisches* museums) and gastronomic (*Naschmarkt*) places. Important places are also visualised by *pictograms* and *graphic* elements. In this case, *pictograms* are used for landmarks (*TUW*, *Home*) and art and culture venues (*Museums*, *Oper*, and *Stephansdom*), whereas *graphical* depiction is used for the natural elements (*Donau*, *Donaukanal*) and urban environment (transport). Emotional components of the mental maps include *pictograms* and *geometric* elements. *Pictograms* show visualised thoughts and expectations, such as the sun, memories and experiences (*people*, *beer*, etc.), as well as landmarks, namely statues and map symbols (*heart*, *emoji*, and *people*). From other elements, the river and parks have been indicated, which are depicted with *geometric* elements (Figure 4.31).

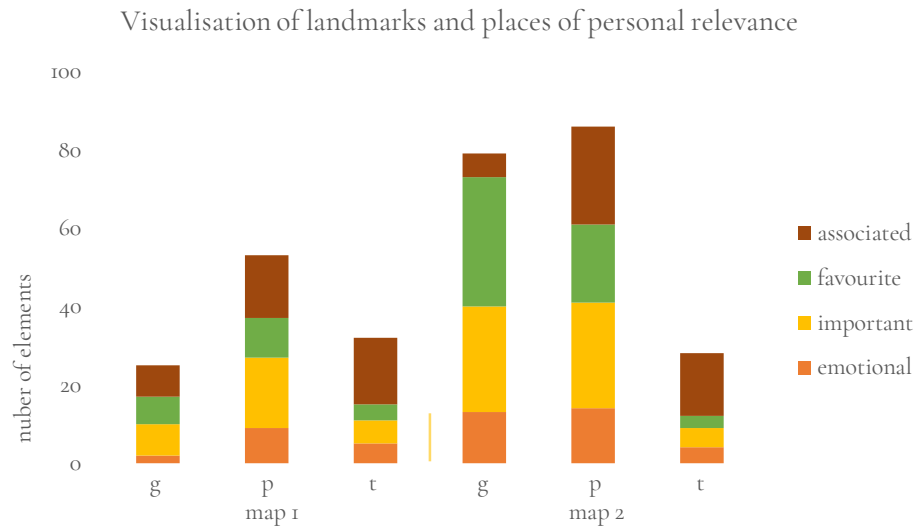


Figure 4.31: Visualisation (geometric (g), pictogram (p), and text (t)) of landmarks and places having personal relevance.

Colour choice

One component of the visual language used in mental mapping is colour choice. During the interview, students were asked to name which factors had defined their colour choice both for their first and second mental maps. They were free to choose more than one answer. In total, from 24 participants, 52 and 58 responses were collected for their first and second mental maps, respectively.

Regarding the first mental map, the majority of students (31%) chose colours following the *logical associations*, such as colouring water bodies in blue, parks in green, etc. Another significant category was *other* (29%). Before the user study, students were asked to have colourful pens or pencils for performing the task; however, among those who voted for the category *other*, 93% (14 students) named that they did not have enough colours available. The remaining 7% in the category *other* had a visual impairment. *Artistic vision* (15%) and *favourite colours* (13%) were picked as the following factors for the colour choice. The least important were *subjective associations* (8%), i.e. what the colour means to them, and *did not use colours for any specific reason* (4%) (Figure 4.32).

Colour choice in the mental maps
depends on

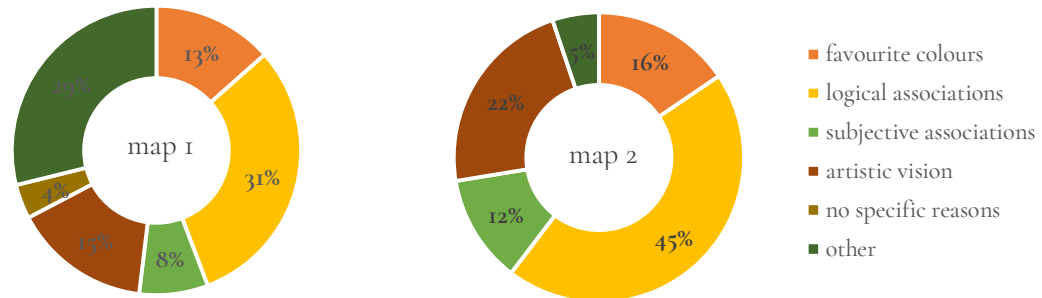


Figure 4.32. Colour choice in the first and second mental maps.

For the second mental map, the main trend of colour choice remained similar to the first mental maps, except for the category *other*. During the second user study and mapping activity, each respondent was provided with the same set of colours; accordingly, limited availability of colours (one of the most frequently mentioned reasons for the first mental mapping) was not indicated anymore. Instead, the category *other* included the reasons such as using colours to emphasise features and visual impairment. The highest portion among the reasons defining colour choice revealed *logical associations* (45%), followed by *artistic vision* (22%), *favourite colours* (16%), *subjective associations* (12%), and at the end the category *other* (5%). In the case of the second user study, none of the respondents stated that they *did not use colours for any specific reasons*.

To conclude, in the case of not being limited with the colours, logical associations are dominant in the colour choice. With this aspect, mental maps become similar to traditional maps or realistic drawings. Next to logical associations, artistic vision also plays an important role in harmonising colours and give the map an appealing look. Favourite colours and subjective associations with certain colours also show an impact on overall colour choice. In the end, colours are chosen for some reasons and they carry meanings in the mental maps.

Use of scale

During the interview sessions, respondents were given their first and second mental maps and asked whether their map elements were at the same scale. In the case of the first mental maps, 58% of participants named that the scale was not the same; accordingly, the remaining 42% thought the opposite. In the case of the second mental maps, the scenario was mirrored: 58% of students thought that their map elements were at the same scale, whereas 42% thought the opposite.

Those participants, who were of opinion that the map elements were not at the same scale, were asked to explain the reason for it. In both cases, for the first and second mental maps, one of the leading reasons was *size shows importance*, which means that participants were emphasizing the importance of features by enlargement. Other groups of reasons are *not considered* (students did not pay attention to the scale factor) and *limitations* related to the scale. The latter included mainly space and time limitation or running out of space because of the large size of the first drawn elements. In the case of some participants, the scale had a *selective* nature, i.e. students were taking it into account for only some elements, such as focusing on things which they knew better (seen in the first mental maps) or differentiating the features which were covered by the virtual and on-site ‘Vienna city walk’. In addition to the above-mentioned reasons, which were the same for both the first and the second mental maps, there were also other factors named. For the first mental maps, students also named *unimportant* (scale not being a core part and therefore not important) as a reason for omitting the scale. In the case of second mental maps, *difficulty* of incorporating scale aspect is additionally in presence (Figure 4.33).

Scale variation for the mental map elements is caused by:

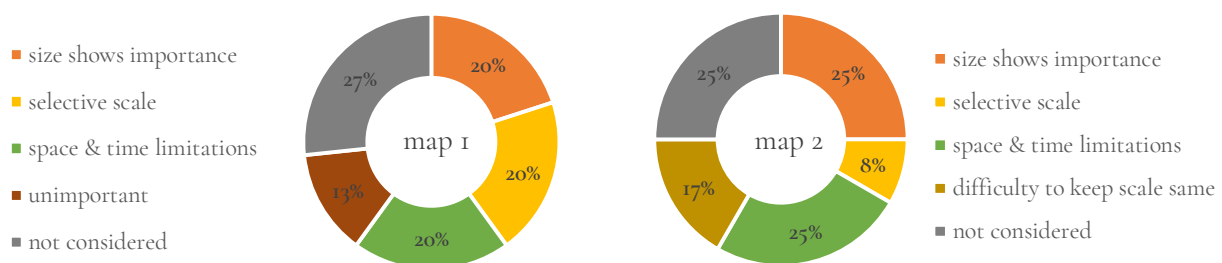


Figure 4.33: The reasons having a different scale for the mental map elements.

Elements of mental maps do not necessarily need to have a fixed scale. It is challenging to keep them at the same scale when having limited time and space and when the mapping process is fully manual. However, around half of the respondents tried to incorporate cartographic principles and keep the desired scale for their mental maps. Others could not keep the scale the same or did not intend to do so, as they thought it was not a core part of mental mapping and did not consider it. Scale can also be purposefully used to differentiate map elements, such as depicting those features larger, which are more important, focusing on familiar objects or areas, etc.

Depiction of surroundings close to home

During the interview session, respondents were asked whether they depicted the surroundings closer to where they lived on their first and second mental maps. The results reveal, in the case of the first mental map, i.e. before respondents visited Vienna, 54% of them did not include their homes or neighbourhoods in their mental maps, whereas 46% did. In contrast, in the second mental maps, 58% included the surroundings of where they lived, while 42% did not include them.

The students were then asked why they did or did not depict their homes or neighbourhoods. Those who included them in their first mental maps named *familiarity* (67%) and *associations with residence* (33%) as major reasons. In the case of the former, students knew where they would live and were familiar with their future neighbourhood; some of them counted home as a central aspect of their lives in Vienna. The latter included associating well-known places with their future residence areas, i.e. living in the vicinity of notable parts of the city. Those respondents, who did not include the surroundings of their future living area in their first mental maps, named *lacking information* (54%), *not considered* and *unimportant* (23%) as main reasons. In these cases, some students either did not have a place yet in Vienna or did not know much about their future neighbourhood; others either did not think about including them or were of the opinion that it was irrelevant for the given mapping task (Figure 4.34).

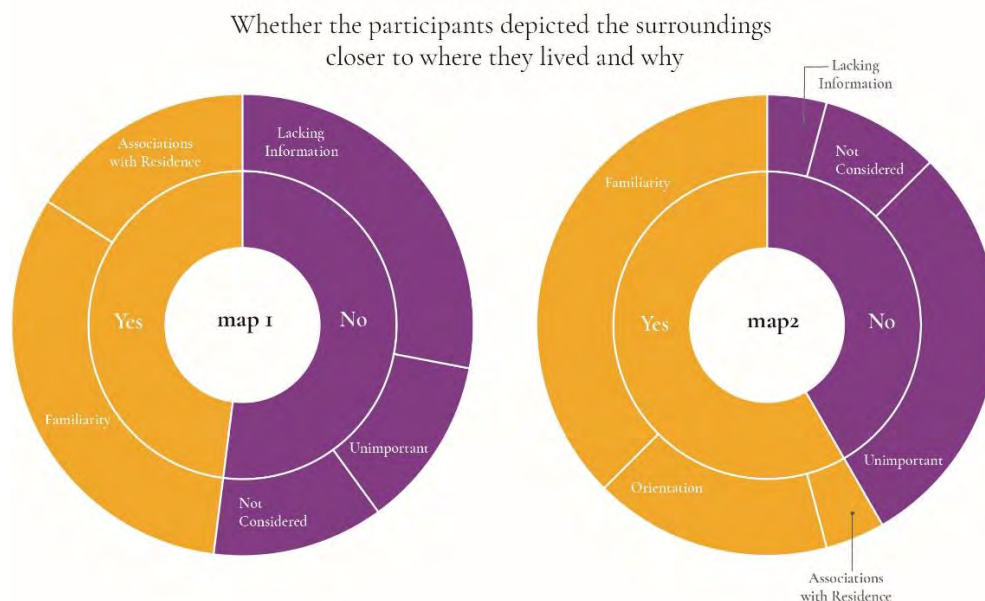


Figure 4.34: Depiction of home and surroundings and the reasons for it.

For the second mental maps, those students who drew the surroundings near to where they lived noted that the main reason for it was *familiarity* (64%) with the area. Others indicated *orientation* (29%) as they were orienting themselves and their maps based on their residential surroundings. Among the reasons, there was also *associations with residence* (7%). In this case, homes of students were in the vicinity of the landmarks which

were covered during the 'Vienna city walk' and later visualised in their mental maps. Those students who did not depict surroundings near to where they lived thought that this aspect was either *unimportant* (70%) or they did *not consider* (20%) it. These students mentioned that they lived in a usual residential area which not necessarily needs to be included in their mental images; others just did not remember to draw it. Few students also referred to *lacking information* (10%) about the exact location.

As shown, for some people, homes are integrated parts of their mental images, while others did not consider incorporating them. The presence of homes and their surroundings increased after moving to Vienna, as respondents were getting familiar and more attached to these places. Including homes in mental maps help some people to orient themselves as well as features of maps in relation to each other. However, not all students depicted homes in their mental maps. It is explained by either forgetting to consider including them or by the fact that they did not have high importance, or the neighbourhood was not interesting enough to be depicted in the mental images which showed prominent landmarks and places of Vienna.

Further statements

The concluding question of the interviews aimed to find out from the respondents whether and how different their mental maps could have been if they were to create another one. Nearly half of the respondents (44%) stated that their new mental map would have been different, whereas 26% thought it would have remained the same. Quite a significant portion of the respondents (30%) chose the answer *maybe*. In the case of the responses, *yes* and *maybe*, students were asked to describe how their mental maps might have been different. Their answers were later classified into the following categories: *presented elements*, *accuracy & details*, *scale & extent*, *generalisation*, *visualisation*, and *personalisation* (Figure 4.35).

A new mental map could be defined by different

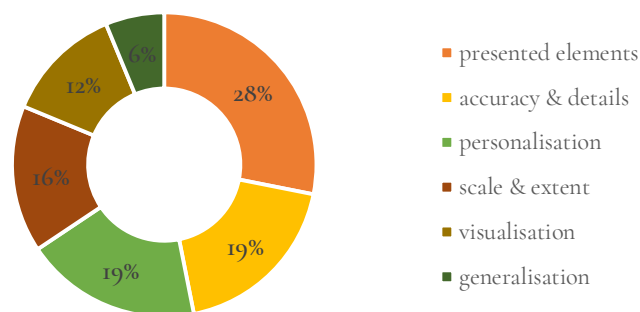


Figure 4.35: The aspects that can be different in a potentially new mental map.

Most students stated that in their new mental maps, they would have included more landmarks, places and, in general, different features. All those answers were grouped in the category of *presented elements* (28%). The next most significant categories were *accuracy & details* and *personalisation* (19% each). For the former, students expressed their desire to be more accurate in their mental maps and to include more details. For the latter, participants wished to depict more places related to their personal experiences and preferences, such as favourite places and homes of friends. *Scale & extent* related answers (16%), such as smaller or better scale and depicting larger area, were followed by the category of *visualisation* (12%), showing enthusiasm for seeking better ways of conveying information. The last category was *generalisation* (6%), where students expressed their intention to create more generalised mental images. The respondents, who stated that their new mental maps would not have been different from their current ones, were next asked the reason for this. Among the reasons most frequently named were already having well-established mental images of Vienna. Furthermore, they noted that there were no significant changes in life after the ‘Vienna city walk’ (time of creating the last mental maps) which could have been reflected in their new mental maps. The argument of having a firmly formed mental image is further supported by the classification (used in this study) of the second mental maps. This classification groups second mental maps into *experience-based* and ‘*Vienna city walk depicting* categories’. Of the respondents (71%) who noted that their new mental maps would not have been different, most of their second mental maps fall in the category of *experience-based* mental images. These mainly depict personal experiences rather than the landmarks and places covered within the ‘Vienna city walk’.

The respondents who were thinking that their mental maps could have changed gave different reasons for it. They noted that mental maps are variable and can be different each time. The place where one draws a mental map can also be important in defining the depicted area in the mental map. Moreover, recent events and experiences significantly alter the mental image and, subsequently, the mental map. This idea is supported by looking at the categorisation of the second mental images, where about half (54%) falls into the category ‘*Vienna city walk depicting*’ mental maps. Without this event, all these maps could have been different. In the end, it is challenging to measure what counts as similar or different mental images and maps, the aspects such as levels of detail, ways of communicating information or a larger context.

4.3.4 Conclusion

In the mental images and emotions created before visiting and after living in Vienna, landmarks and places with personal relevance play an important role. The core parts of the mental maps are the landmarks and places that can be associated, favourite, important, or emotional. Within this study, they were classified in the following categories: *landmarks & buildings*, *art & culture*, *urban environment*, *parks & nature*, *river & surroundings*, and *other*. The presence of the places of personal relevance in each category shows a gradual trend change. The landmarks (palaces, churches, art-related venues, etc.) are strongly associated with the image of the city. Therefore, they are significantly presented due to visiting patterns, memories of the students, and the visual qualities of the landmarks. Their proportion decreases gradually in the groups of favourite, important, and

emotional places, whereas a portion of the river and surroundings increases notably due to personal experiences and memories, socialisation, and different activities. Moreover, in the groups of important and emotional places, a considerable cluster of responses appears in the category *other*, which includes homes. These places are strongly related to the feeling of belonging and familiarity. Having first-hand experiences is crucial, which is why the proportion of art- and culture-related venues decreases. It is caused by the rare (or not at all) visits to those places, and therefore fewer experiences. On the one hand, the portion of the river, its surroundings, and homes increase significantly as these places are frequently experienced and, in addition, have strong emotional importance.

Mental mapping is a complex process that requires recalling knowledge, memories and/or emotions, spatial thinking, selecting features from the mental image to create a context, and finding ways to communicate all this visually. Among those aspects, the drawing process is identified as the most enjoyable and the most challenging part of the mental mapping. After getting acquainted with the city, an aspect previously named difficult (having limited knowledge) was replaced by a new and enjoyable one (knowledge gain), albeit establishing spatial relations remained challenging. Among the positive parts of mental mapping, excitement was replaced by enjoyment in linking places with associations. Recalling and reflecting on memories are significant positive parts of both sessions of mental mapping. Mental mapping is related to and accompanied by emotions. As the user studies reveal, these emotions are primarily pleasantness and excitement. In the first user study, participants also referred to anticipation, neutral or rather unpleasant feelings caused by study-related worries. In the second user study, the feeling of belonging also played an important role, which was reflected in creating more personalised mental maps. To conclude, emotions influence the mental mapping process and are reflected in the mental maps that carry the emotional character.

Looking at the similarities and differences between the two mental maps from the perspective of the map-maker is important. For the former group, respondents mainly refer to the depicted features or other map elements (labels, symbols, texturing, extent, and layout). In contrast, group of differences reveal more details and includes categories such as selection of elements, personalisation of the map, ways of visualisation, scale and extent, accuracy and level of details. To conclude, a group of similarities can be helpful in evaluating the first of mental maps, as it describes the elements of the first mental maps, which are still presented in the second. In contrast, differences say more about second mental maps, namely about the elements which distinguish mental maps from one another.

The mental maps that are drawn before and after living in Vienna reveal interesting insights. Both sets of maps combine the features from all the categories: *urban environment*, *art & culture*, *landmarks & buildings*, *river & surroundings*, *parks & nature*, and *other*. The first mental maps include fewer and generic elements (without concrete landmarks or place names). They are defined by thoughts and expectations towards Vienna, reflected in the presented map features. These maps are mainly focused on the city centre and are frequently given a title to emphasise the place depicted. On the other hand, the second mental maps are presented with a greater number of elements (with the concrete place and landmark names), which are often personalised and show either importance, associations or emotional connections. These maps are marked by memories and

experiences, which largely define a set of included elements and, in general, the area of the focus of the map. Second mental maps are not given titles as often anymore, which shows a familiarity of the map-maker with the place and confidence that the mapped area will be recognised even without giving it a name. However, second mental maps are still rich with labels, mainly related to depicting the information obtained during the ‘Vienna city walk’, which turned into the integrated part of mental images.

Mental map elements are depicted differently with geometric forms, pictograms, and text. The linear elements such as a river, channel, transport lines, streets, and borders of the districts are mainly visualised by geometric shapes. In addition, these urban environment-related features are systematically labelled to give them a context; whereas the river and its surroundings are rarely accompanied by the text. The reason for it is that they are unmistakable nature elements even without the labels. In the depiction of elements, such as the river, channel, and the parks, sometimes shape and colour play a sufficient role. The latter is often illustrated with only geometric shapes, sometimes accompanied by the label and rarely visualised by pictograms (in case of having a specific detail). In the first mental maps, art- and culture-related venues, landmarks, and important buildings are depicted with simple geometric shapes or generalised and universally identifiable symbols. In the second mental maps, they are replaced by pictograms showing recognisable details of those iconic landmarks. In addition, pictograms are often applied to express thoughts and expectations (in the first mental map) and memories and experiences (in the second mental maps). Texts are often seen in combination with geometric features and pictograms. Therefore, they are the most populous group of visualisations in both sets of mental maps. Regarding the first mental maps, texts provided more explanatory meanings to the elements, which otherwise were not easily identifiable. These mental maps are also characterised by more frequent use of titles, which provides a general context. In the second mental maps, texts remain majorly presented, however in this case, they are used to give specific details about the depicted elements which otherwise cannot be understood properly (such as labels for transport lines, district numbers, etc.). Moreover, they illustrate memories and associations by providing no single words but sentence-like labels. This, in the end, gives rather deeper meanings to places, which are enriched by personal experiences. To conclude, text is primarily used for associations, whereas for favourite, important and emotional places, geometric and pictorial visualisation are more present. However, all these three ways of visualisation complement each other and often are presented in combination. With geometric elements, the map-maker communicates general information about the places and landmarks, providing pictograms that give more details to the depicted features, and adding a text that provides a context. A combination of all of these components makes mental maps personal and unique.

Mental maps have some similarities and differences with traditional maps. They get closer to conventional maps or realistic drawings with the colour choice aspect, where colour choice is defined by logical associations. In mental maps, artistic vision also plays an important role in harmonising colours and giving the map an appealing look in addition to logical associations. Favourite colours and subjective associations with certain colours also show an impact on overall colour choice. In the end, colours are chosen for some reasons and they carry meanings in the mental maps. In contrast to colours, mental maps reveal differences with traditional maps regarding the scale. The elements of mental maps are often at a different scale. Keeping the same scale is challenging and often referred to as unimportant by the respondents. However, half of the respondents tried

to take into account the scale and harmonise map elements. Those who intentionally differentiated it aimed to emphasise the importance of objects and areas by enlarging them. In contrast to traditional maps, mental maps are highly personalized depictions. They usually include not only a personal perspective of seeing the world, but also personal information, such as homes. The presence of homes and their surroundings is related to getting familiar and emotionally more attached to these places. In addition, depicting homes can play a role in orienteering oneself and situated landmarks of the mental map. The absence of homes indicates that either they were forgotten, did not have high importance, or the neighbourhood was not interesting enough to be included in the mental map.

Mental maps, even if they are based on well-established mental images, are variable. The elements they include, ways of visualisation, level of personalisation, and other aspects can differ from one mental map to another, created by the same person. These representations of mental images and emotions are affected by cognitive and lived experiences, associations, recent events, and current feelings of the map maker.

5 Summary and outlook

5.1 Research findings

Mental maps are graphical representations of the space; they share similarities with traditional maps but are largely personalised and enriched with emotional components. They are affected by different factors and therefore need to be studied with a holistic approach. Analysing mental maps created before and after living in a city help contribute to better comprehension of mental maps and related emotions.

The mental images and emotions that people hold towards places before visiting them are defined by the associations and the experiences. These experiences can be cognitive, i.e. attained knowledge, first-hand, such as memories or recent experiences. Prior knowledge and especially first-hand experiences have a significant influence on mental images. In addition, associations accumulated over time can be generic but still show impressions and expectations towards places and socially widespread opinions. They largely shape the mental images of and emotions towards places. Moreover, recent experiences (such as the virtual ‘Vienna city walk’) significantly influence mental images and emotions by presenting new knowledge and evoking curiosity and anticipation towards places. This impact is reached by using different means of communicating the information. Visual media (such as images and videos) play the most significant role, both in mental images and emotions. Furthermore, narration and the factor of the narrator largely define emotions. The result is reflected in the visual composition of the mental maps. They often include the places and landmarks which are seen and experienced recently and have personal relevance for the map-maker, i.e. associated with certain feelings, memorable for their character or visual properties. Moreover, mental maps reveal a highly positive nature, i.e. they mainly show positive parts of the mental images. To conclude, analysing the mental maps drawn before visiting the place and accompanying emotions reflects the image of the city, which is defined by first-hand, recent and cognitive experiences, and already existing associations.

Mental maps of a city and related emotions after living in that place are mainly defined by associations and personal experiences. The primary associations, which show thoughts and expectations towards the place, turn into personal experience-based associations over time. However, they remain stable, generic and abstract even after getting familiar with the places. Many of these associations are already experienced, and therefore, integrated parts of the mental maps and emotions. Another factor that needs to be taken into account to

understand mental maps are experiences, both long-term, such as living experiences, and recent, such as the on-site 'Vienna city walk'. The former is a significant factor that mainly defines emotions related to the places and shapes mental images. They combine living experiences, memories, and attained knowledge (also influenced by media and the promoted city image). Mental images are not static, they are dynamic, and change as knowledge and experience about the place grow. Becoming familiar with the city results in depicting more landmarks and places and, in general, more precise and accurate mental maps. However, similar to the first mental maps, new ones still include associations, experiences, and emotions. Mental maps of the city illustrate those elements that have personal relevance for a person, i.e. they mainly show associated, favourite, important, and emotional landmarks and places. However, mental maps represent not only well-established and long-term experience-based mental images but also include the most recently experienced events and emotions. In addition to long-term experiences, recent ones are also crucial for shaping mental images. They can revive existing memories and enrich them with new impressions. Moreover, new knowledge and experiences, especially personalised and related to positive emotions, are better remembered and integrated into mental images. Those events that create the bonds between individuals and their environment have a more significant influence and therefore are translated into mental maps. To conclude, recent experiences, current surroundings and emotional state together with cognitive and lived experiences shape mental maps, making them variable and unique each time they are created.

In addition to the experiences and associations, the mental image of the city is affected by the urban elements that have strong perceptual importance. Key features and distinctive landmarks of the city are remembered easily due to their visual or functional importance. They then turn into the associations, which at the end, are reflected in the mental maps. However, these recognisable landmarks with their visual essence do not necessarily establish strong emotional connections. Sentimental attachments are rather related to the places which are associated with different emotional experiences. These sites are favourite or so-called emotional landmarks and places and are one of the core parts of the mental maps. Furthermore, the current emotional state also significantly influences the composition and the context of the mental maps. To conclude, emotions not only affect the mental mapping process, but they are also integrated elements of it. Emotions shape mental maps and enrich these graphical depictions with more subjective meanings of the space defined by personal experiences.

5.2 Limitations and future research

The scope of this research is limited by the number of participants (around 25 people) and, therefore, mental maps drawn before visiting and after living in the place (48 maps in total). Moreover, the sample was quite homogenous. Although the participants had different cultural backgrounds, most of them were in the same age category and are currently in the same occupation. Thus, the chosen sample can be seen as less representative, and the results of the study cannot be generalised to the wider population. Another factor related to the selected audience is that before the first user study, which aimed to find out the perception of people not yet familiar with the city, nine respondents already had prior first-hand experience of Vienna (a short-term visit). Evidently, these experiences affected not only their first mental maps but also, in general, the image of the city before visiting it.

The study is also constrained by the choice of the 17 urban landmarks and places for the ‘Vienna city walk’. These landmarks were selected based on the assumption that their symbolic and functional importance could shape a strong, well-identifiable mental image. Furthermore, the proximity between the landmarks and their central location have also been taken into account in this selection. In addition, in the second user study, not all 17 landmarks were covered in each walk. They were instead divided into three thematic groups due to the length of and the needed time for the entire route. However, it would be interesting, to incorporate additional landmarks and places of the city as well. Or alternatively, to mainly focus on the landmarks which revealed a significant presence in the findings of this research.

A few aspects of the user study settings can be discussed as another limitation. Despite keeping the research design nearly identical for both user studies, the first user study had to be conducted online due to the COVID-19 pandemic. Consequently, its setting was less controlled by the interviewer. Employing the first user study in person could have given different outcomes. On the other hand, the second user study is positively affected by the season it was carried out. The summer season and related activities have significantly influenced obtained results. It would be worthwhile to conduct a similar study in another season and compare the findings with the current one. Another limitation of the study setting are the interview sessions, which were carried out only after the second user study. Participants were given their mental maps and questions about them and their emotions were asked. It was quite challenging for the respondents to answer some questions related to their first mental maps drawn three months earlier. For future research, the recommendation would be to conduct the interviews, if possible, right after the mental mapping process while the images and emotions are still vivid. Discussing the research design and its influential factors, the role of the interviewer should also be taken into account. The narration of the interviewer could stimulate certain emotional responses of the respondents and accordingly affect the outcomes. To check this assumption, it would be beneficial to conduct a similar study carried out by different interviewers.

In this study, emotional responses were measured based on self-reports. To measure affective and emotional responses more objectively, it would be recommended to observe the body's reaction with the help of using biometric technologies. This, on the one hand, has the advantage of not being subjective or conscious as self-reports; on the other hand, linguistic confusion of interpreting words can be avoided, which was the case for the mood scale of the positive and negative affect schedule (PANAS).

Finally, the data of the second user study was collected in a traditional manner: paper-based mental maps and questionnaires and recorded interviews. On the one hand, this chosen research design played a positive role in collecting authentic results. On the other hand, it was challenging to digitise and transcribe all qualitative data and find the best possible framework for structuring them. In the case of having larger datasets, it can be crucial to use a programming language for structuring and analysing collected data efficiently. For a future study, it is recommendable to use the digital ways of survey and, in general, less open questions and shorter interviews. However, before employing a similar research design for other cities, it is recommendable to conduct a pre-test and, based on its outcomes, fit the suggested framework of this study to the needs and interests of the case.

To conclude, there is room for enriching understanding of the mental maps and their importance as a research method next to other frequently employed qualitative and quantitative methods in future research. As this study revealed, a huge amount of valuable information can be extracted from mental maps, which is very meaningful if interpreted with other techniques. This qualitative data has a big potential to be further analysed not only in relation to emotions but also about the perception of places and in general spatial thinking. These can be fields of future research where mental mapping can contribute. The outlook can also be a more systematical study of the images of cities, i.e. conducting multi-disciplinary studies about the city perception at different cities and with different target groups. Elaborating on the discussed limitations of this research and taking into account given recommendations will result in improved methods of researching and interpreting mental maps.

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Appendix

This appendix is divided into two main parts – the first and the second user study. The sections represent the variety of materials used in this research such as hand-drawn mental maps, the “Vienna city walk” presentation and scripts, and surveys (including questionnaires, mood scale tests and interviews).

A First user study

A.1 ‘Vienna city Walk’ (online)

A.2 Mental maps

B Second user study

B.1 Introduction to the second user study

B.2 Participant consent form

B.3 Questionnaire (part 1)

B.4 The PANAS (part 2)

B.5 ‘Vienna city walk’ (on-site) (part 3)

B.6 ‘Vienna city walk’ notes

B.7 Instructions for mental map drawing

B.8 The PANAS (part 4)

B.9 Mental maps (part 5)

B.10 Questionnaire (part 6)

B.11 Interview (part 7)

A

First user study

A.I ‘Vienna city Walk’ (online)

Part 3

In the following pages, the slides, which were used for the digital tour of the ‘Vienna city walk’, are presented. The slides represent the landmarks and places included in the ‘Vienna city walk’. Numbers on each slide correspond to the points of interest indicated on the ‘Vienna city walk’ map. Additionally, narrations, given by the presenter, can also be found below some of the slides.



“Now we would like to bring you into Vienna mood“.



Vienna city walk

You'll experience music, art, wonderful places, and impressive architecture on this city walk. It leads to all the main sights around the Vienna city centre.

Source of videos, images and text: Vienna Tourist Board. <https://www.wien.info/en>



“We have identified 17 spots for you which you should visit once you are in Vienna. In May, Mariam will visit and take you on this city walk.”



“TU Wien is your home university for the second semester. The Research Unit Cartography will welcome you on the 8th of March.”

Karlskirche

2



The striking sacred building, with its powerful dome, is one of the most important Baroque structures in Vienna, located on the south side of Karlsplatz.

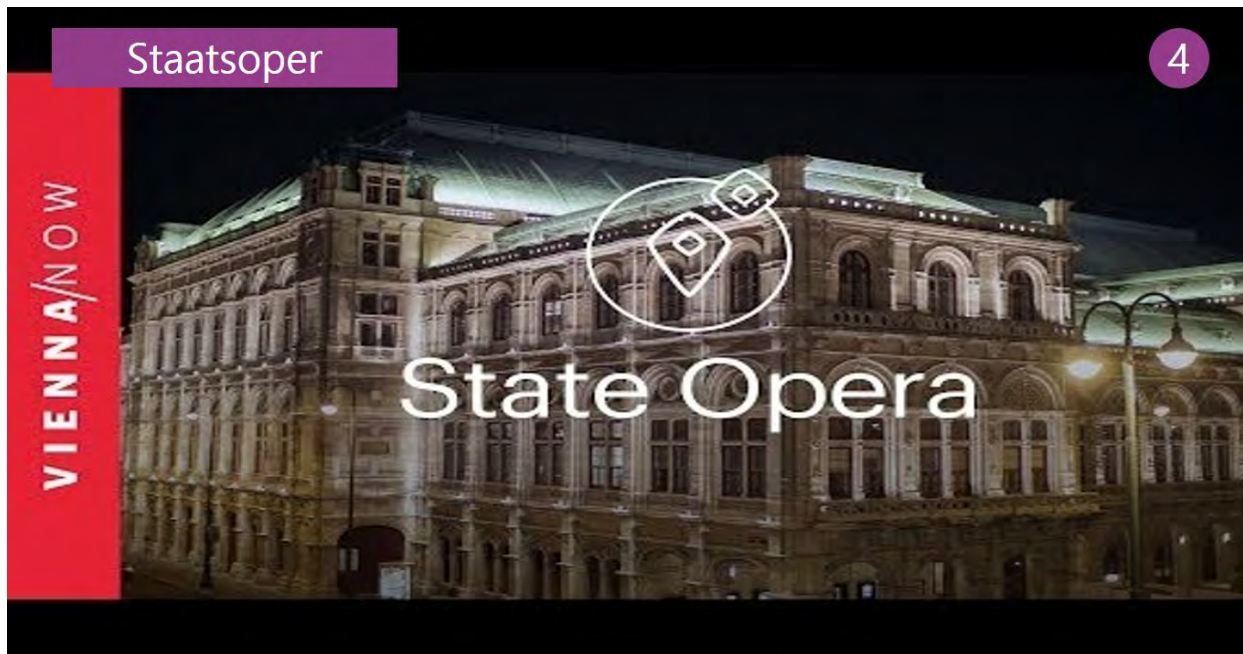
You may use the stop Karlsplatz (lines U1, U2, U4, 4A and 59A) to reach the university.

Musikverein

3



“Vienna is famous for music, right. So the next stop is of course related to music. The Musikverein is a music hall located on the opposite side of Karlsplatz as the university, in the north. It is Vienna's most famous centre for classical music.”



"We continue with music and now we are heading west, to the Vienna State Opera. It is one of the top opera addresses in the world. The variety of the operatic program is unparalleled anywhere in the world."

Museumsquartier



Kunsthistorisches Museum

5

Naturhistorisches Museum

7

"We keep the direction and reach the MuseumsQuartier (MQ). This is one of the largest cultural quarters in the world. Located at the border of the old city in the former imperial stables, it combines institutions of different art fields, restaurants, cafés, and shops in an area of over 60,000 square feet in a post-modern ambience, a combination of baroque buildings and modern architecture."

Volksgarten

8

The Volksgarten is located on the Ringstrasse and is laid out in the French Baroque style in the form of an English park. It also has a rose garden with over 3,000 rose bushes of more than 200 different varieties.

Rathaus

9



“The City Hall was built between 1872 and 1883 and is a building of superlatives: around 30 million bricks and more than 40,000 cubic meters of natural stone were used. The Arkadenhof of City Hall is one of the biggest inner courtyards in Europe with an area of 2,804 m². When you are staying at Universitätsring, you can see the city hall in one direction and the Burgtheater on the opposite on.”

Burgtheater

10

Discover the Burgtheater on Google Arts & Culture (incl. a street view tour).

“The building on the Ring was built between 1874 and 1888 according to plans of Gottfried Semper and Karl von Hasenauer and remains one of the leading establishments for German-language theatre productions today.”

Hofburg

11



“You can get the best view of the Imperial Palace and the adjacent Volksgarten from the Historic Heldenplatz once planned as an extensive imperial forum. The Imperial Palace is more than just one palace. It is a city within a city – a complex with 18 groups of buildings including official staterooms, museum, national library, and the Spanish Riding School.”

Albertina

12

VIENNA/NOW



Albertina
Museum



“The Albertina has one of the largest and the most valuable graphical collections in the world including the works of the artists such as Dürer and Klimt. Its latest exhibition collection presents masterpieces of the Modern, spanning Monet to Picasso and Baselitz. As the largest Habsburg residential palace, the Albertina dominates the southern tip of the Imperial Palace on one of the last remaining fortress walls in Vienna.”

Stephansdom

13



St. Stephen's Cathedral is the symbol of Vienna which is located at Stephansplatz, a square at the geographical centre of Vienna.

The Cathedral is 107.2 meters high and 34.2 meters wide. It has four towers.

Donaukanal

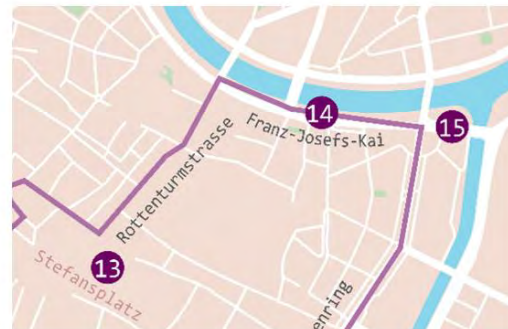
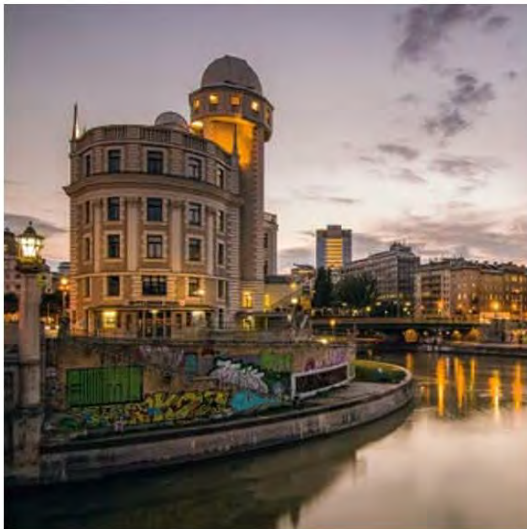
14



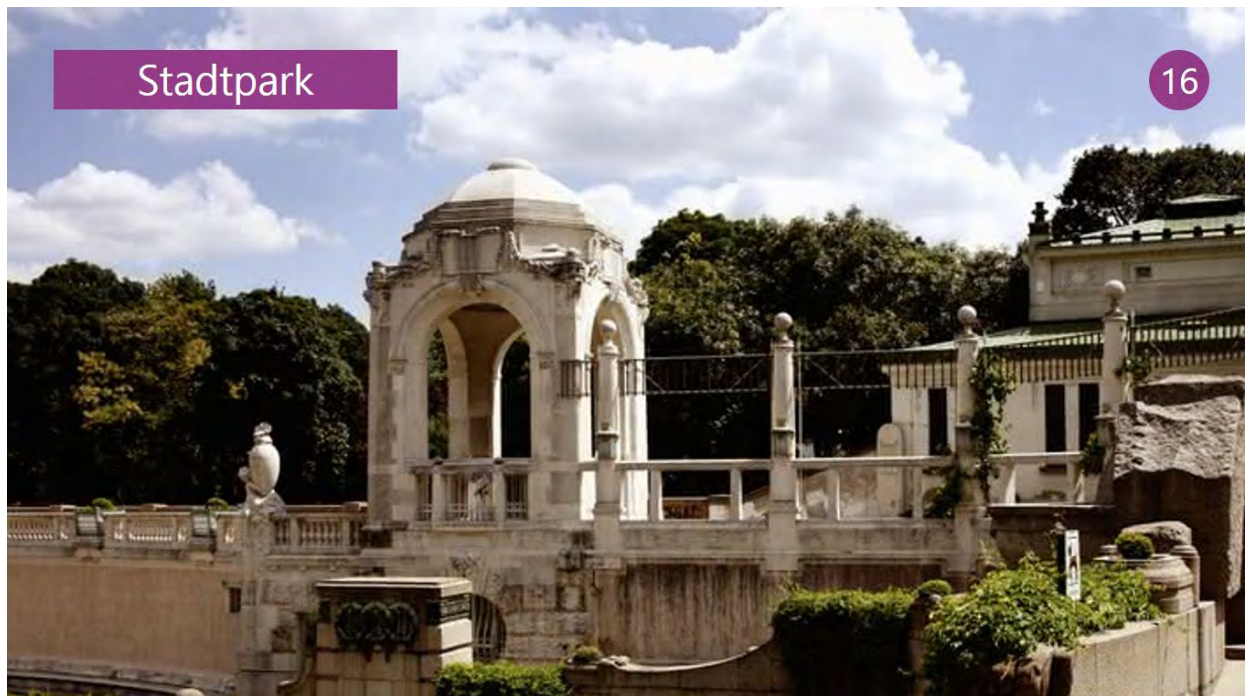
“As you will be in Vienna in the summer semester, you should not miss the Danube Canal. The canal is lined with dozens of beach bars and trendy places to eat and drink. Vienna's biggest legal graffiti zone is also located here. It's definitely worth a look!”

Urania

15



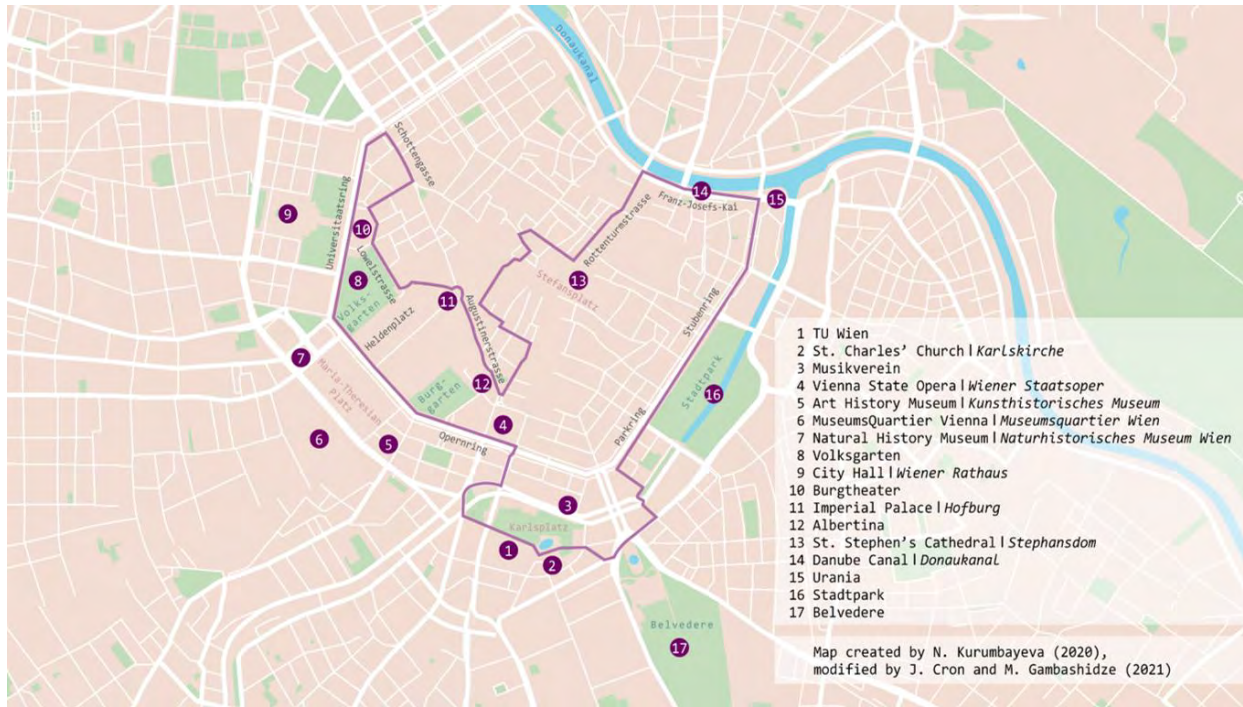
The wonderful Art Nouveau building located on the Danube Canal houses an observatory, a cinema, a restaurant, an adult education centre, and a puppet theatre.



“If you are looking for the ideal place for a souvenir photo, then Vienna's Stadtpark is the spot - at the foot of the golden Johann Strauss memorial, one of the world's most photographed monuments.”



“The Belvedere is not only a magnificent baroque palace and garden, it houses one of Austria's most valuable art collections – with the masterpieces of Gustav Klimt, Egon Schiele, and Oskar Kokoschka.”



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26 FEBRUARY
2021

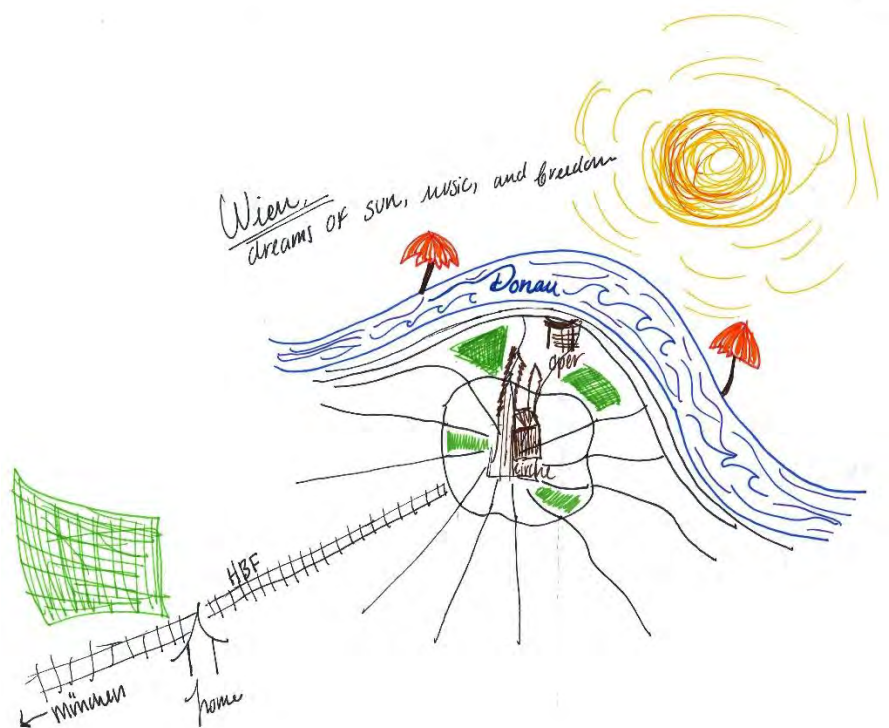


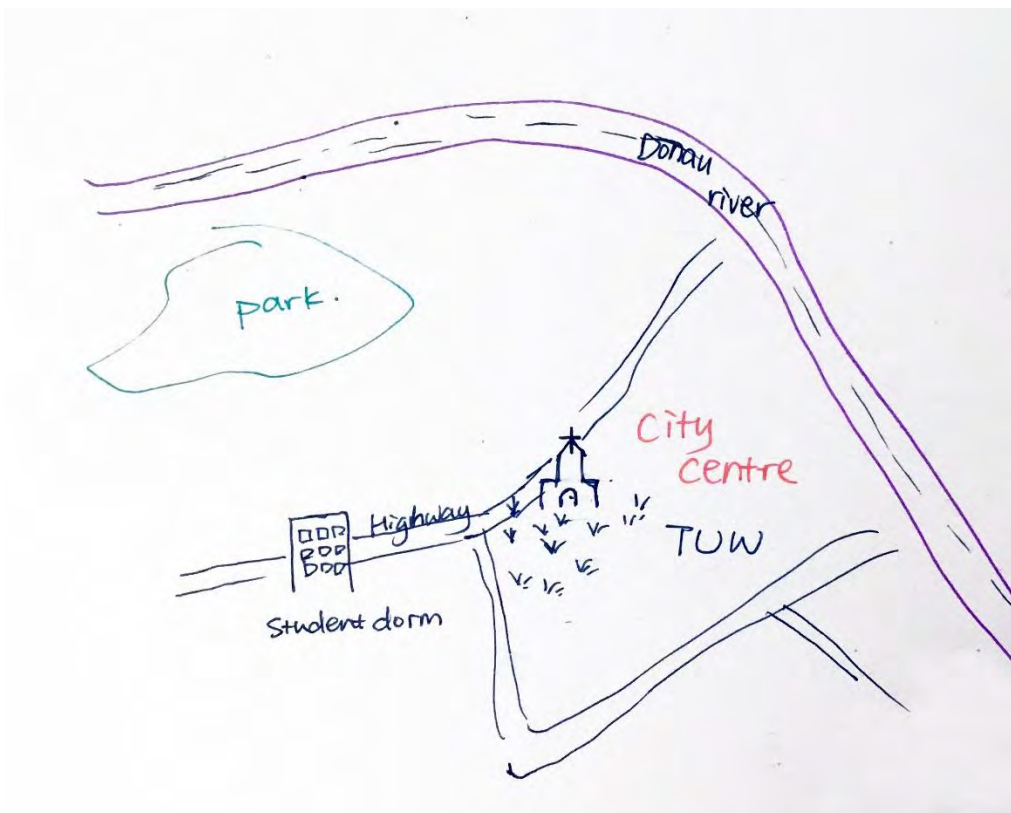
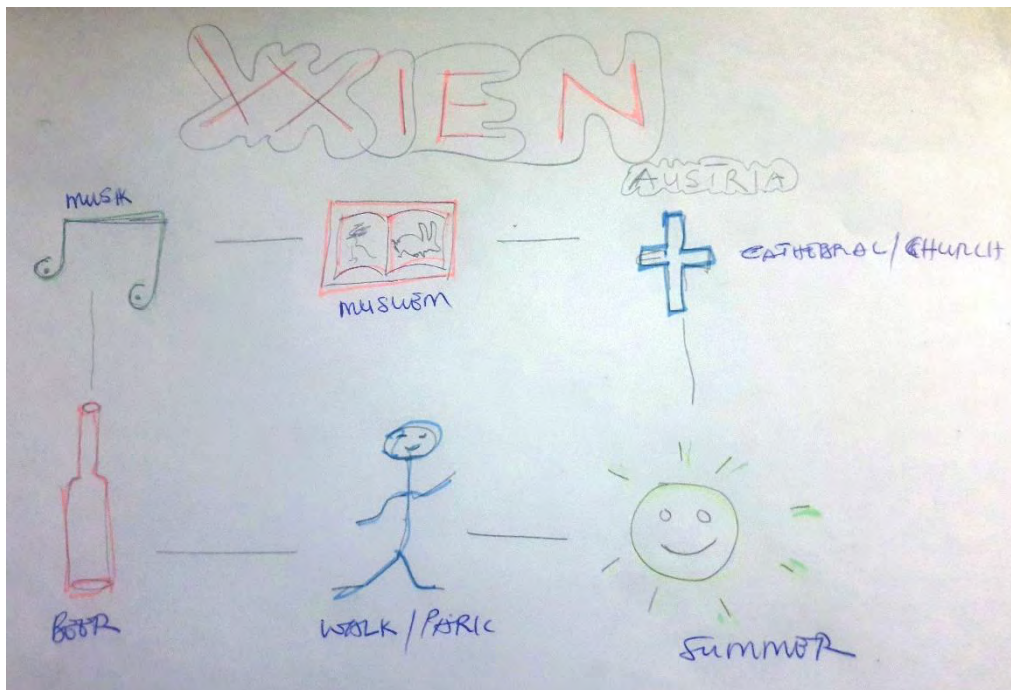
cartographymaster.eu

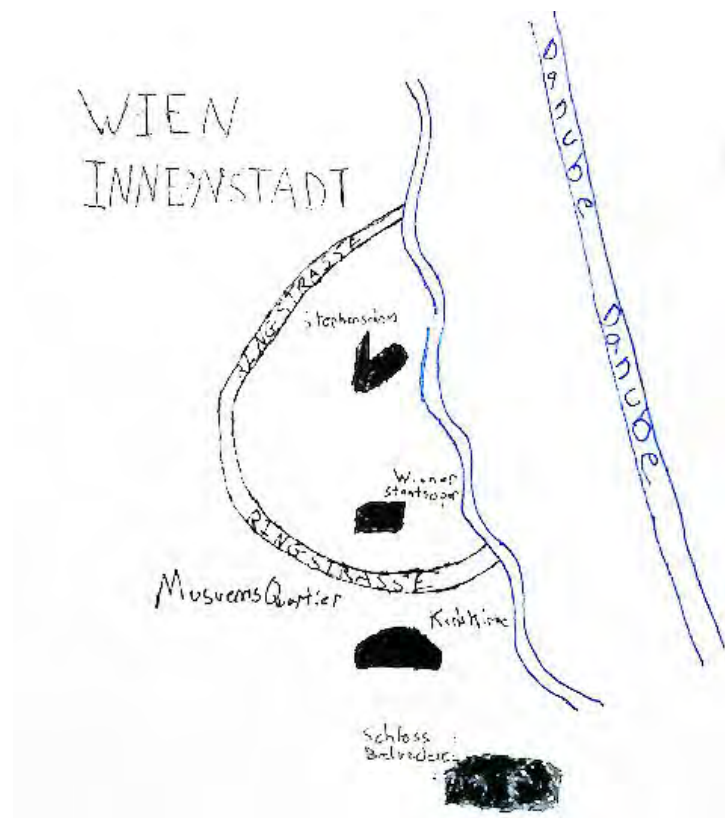
"We wish you an exciting time in Vienna. Mariam will come and visit you in May. Please wait until May and you will do the walk together in person. This is then the second part of Mariam's user study. But for today, after I have introduced this 'Vienna city walk', we need some more feedback from your side."

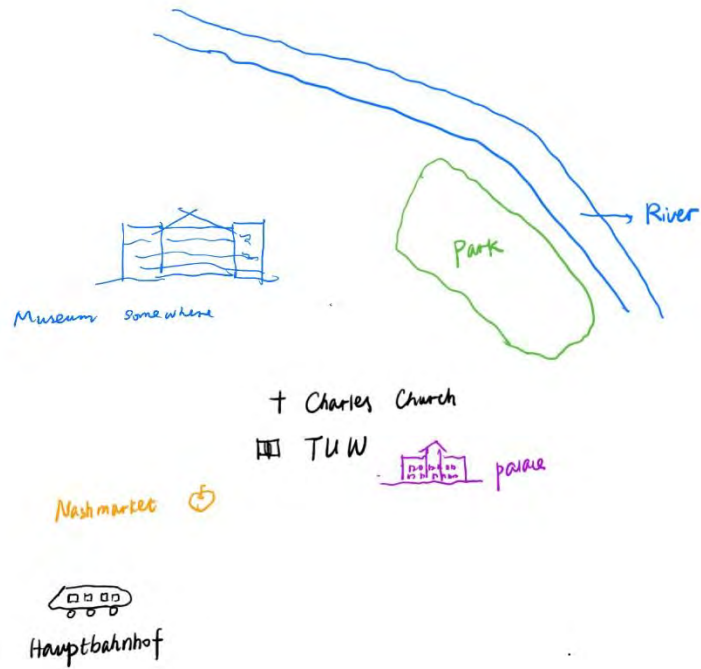
A.2 Mental maps

Part 5



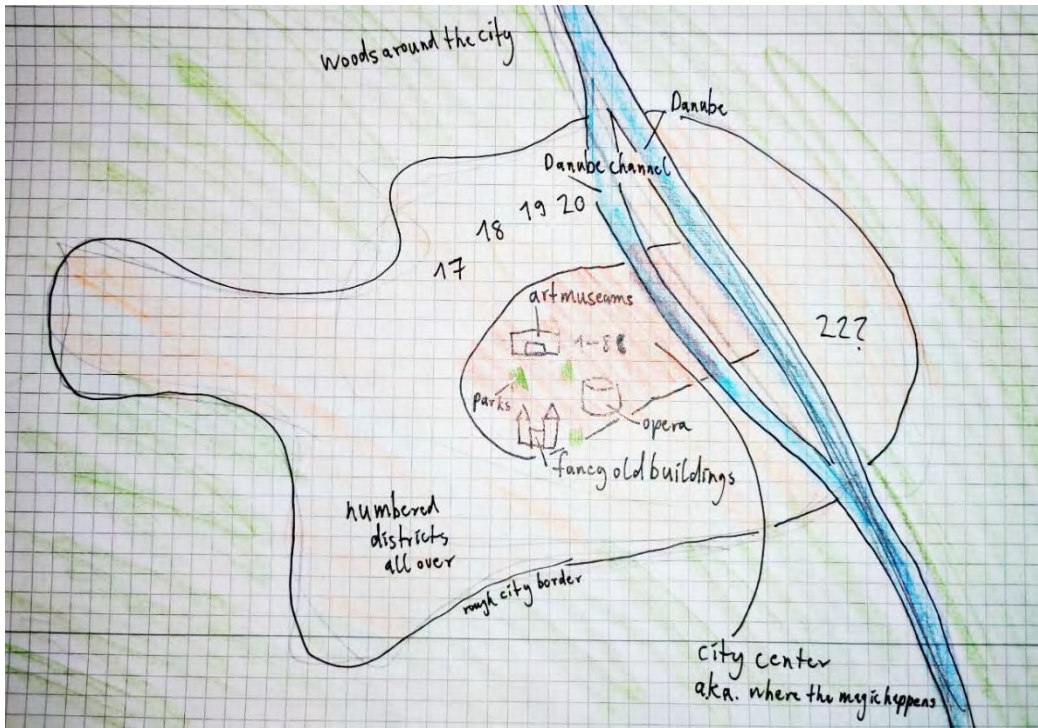


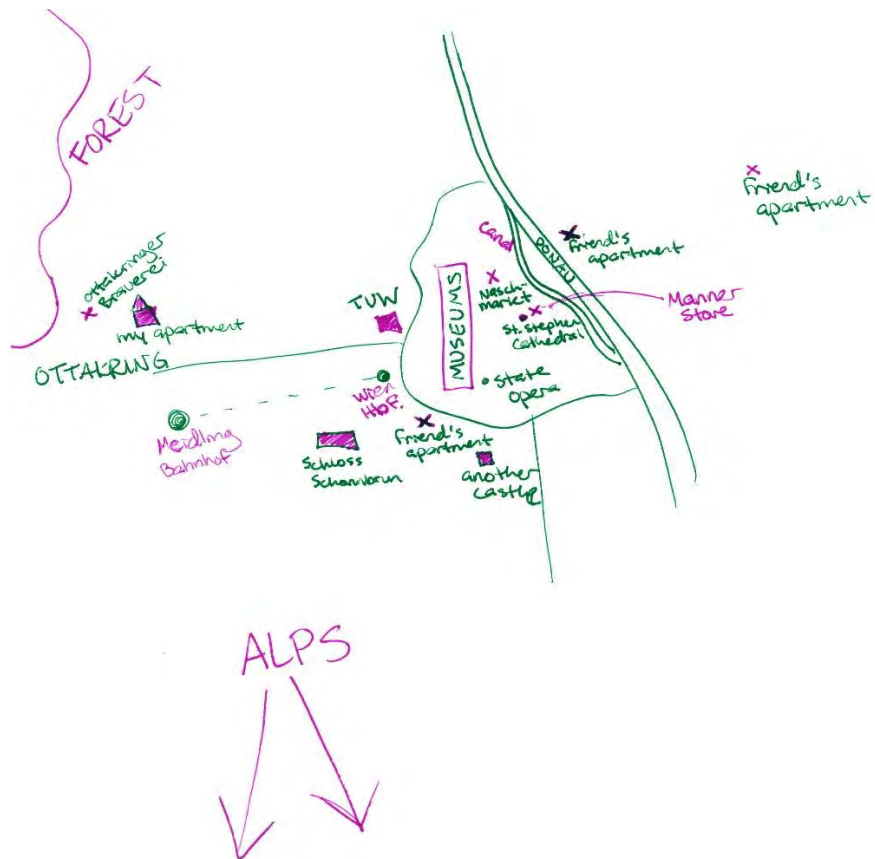
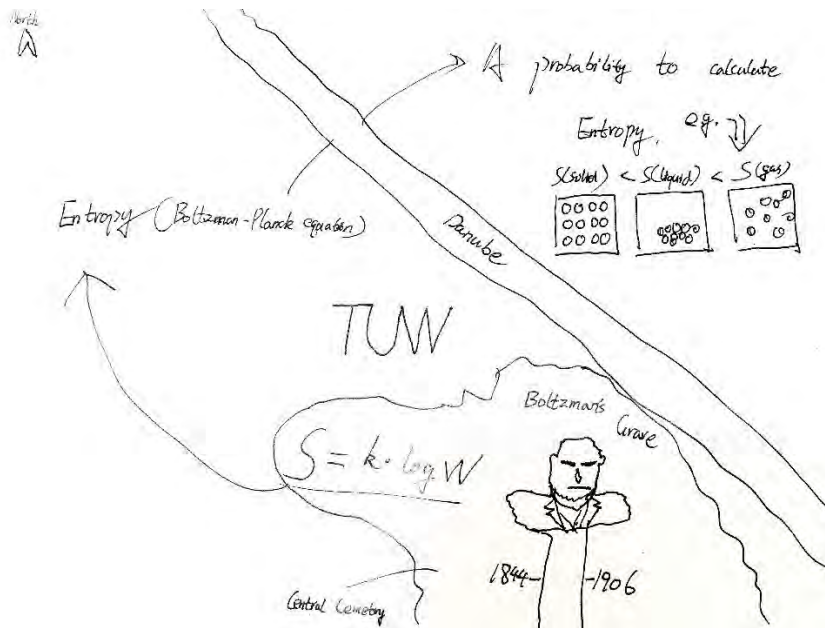




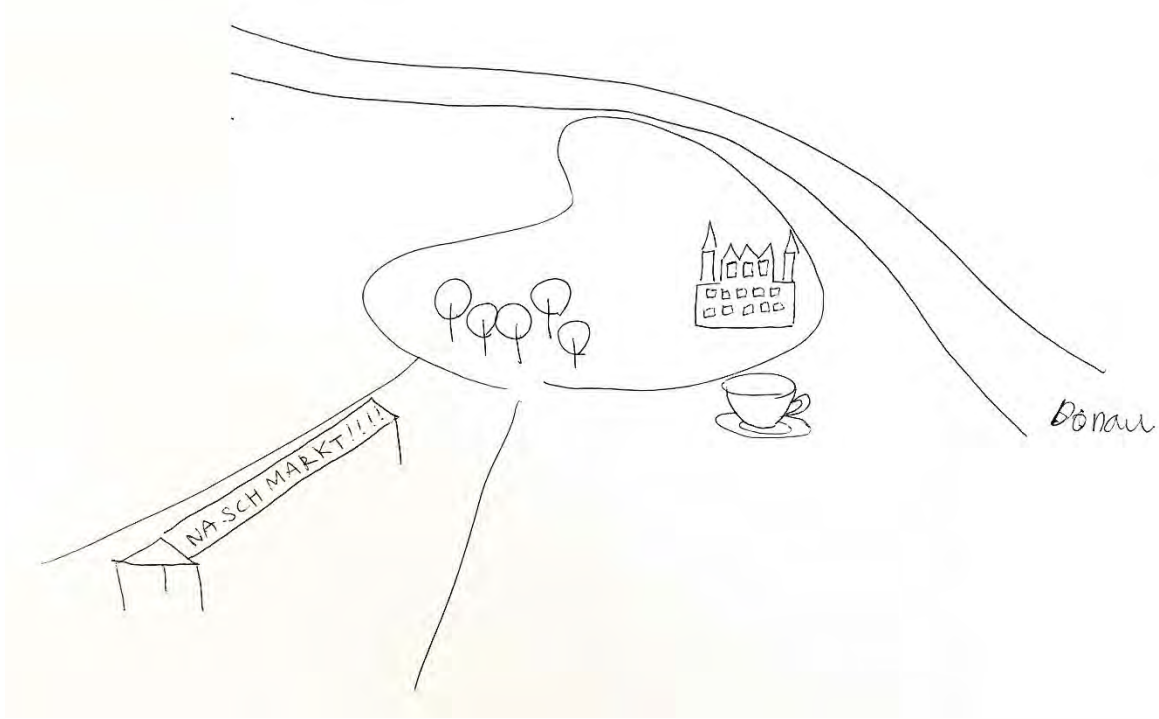
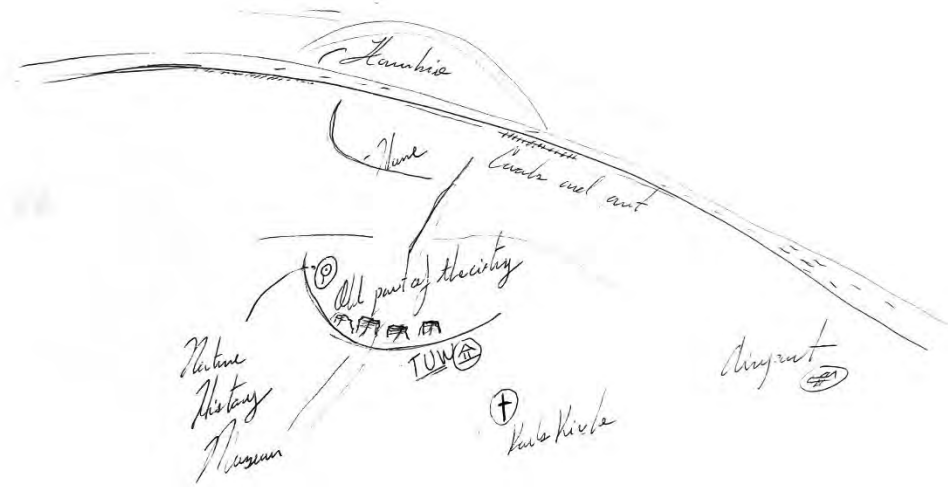


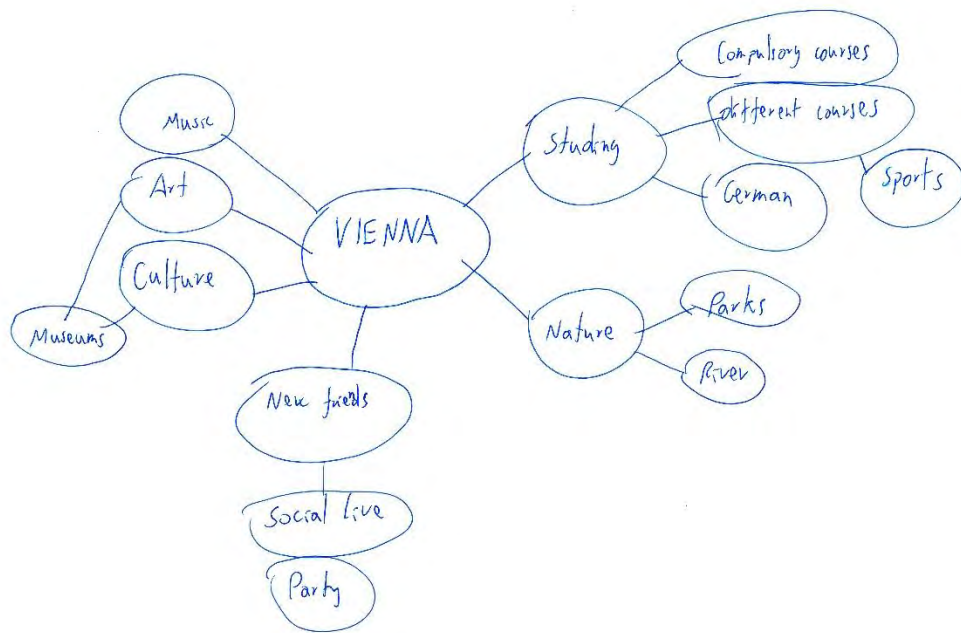
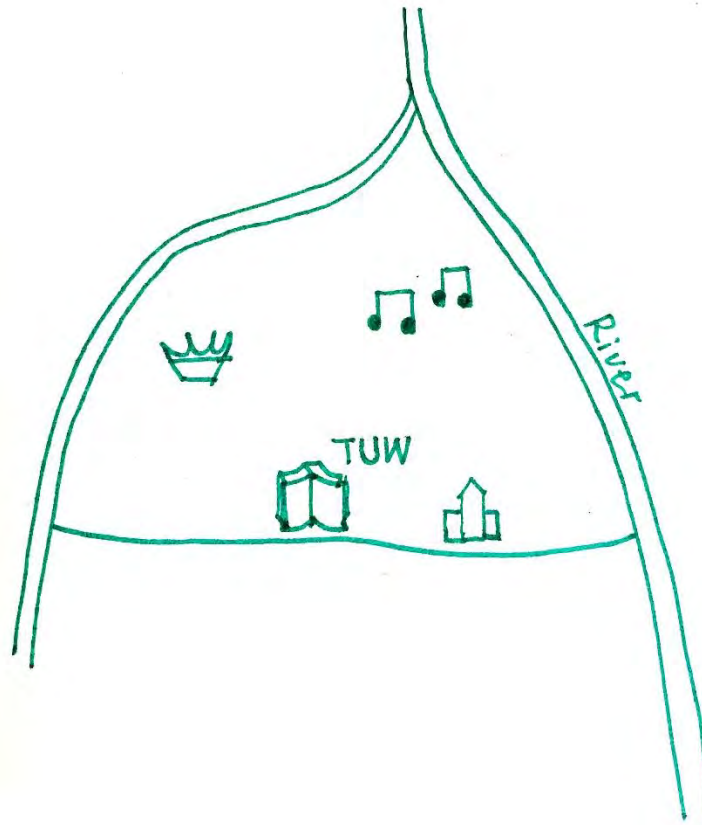


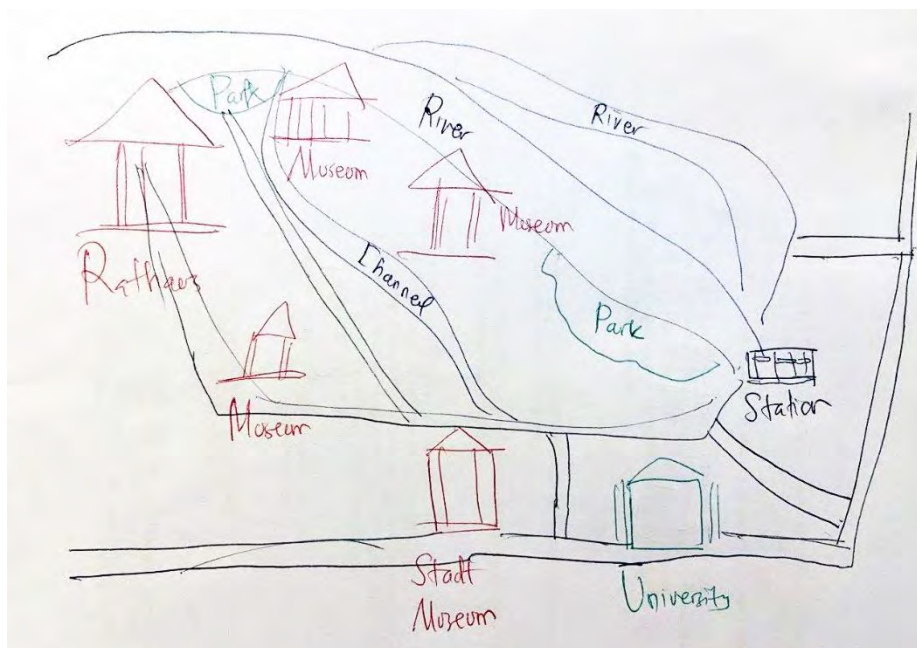
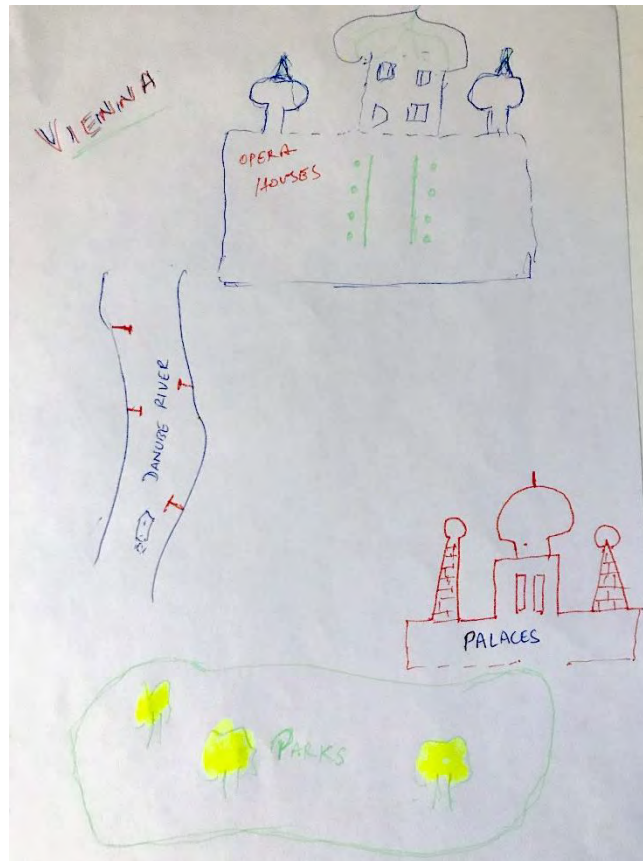


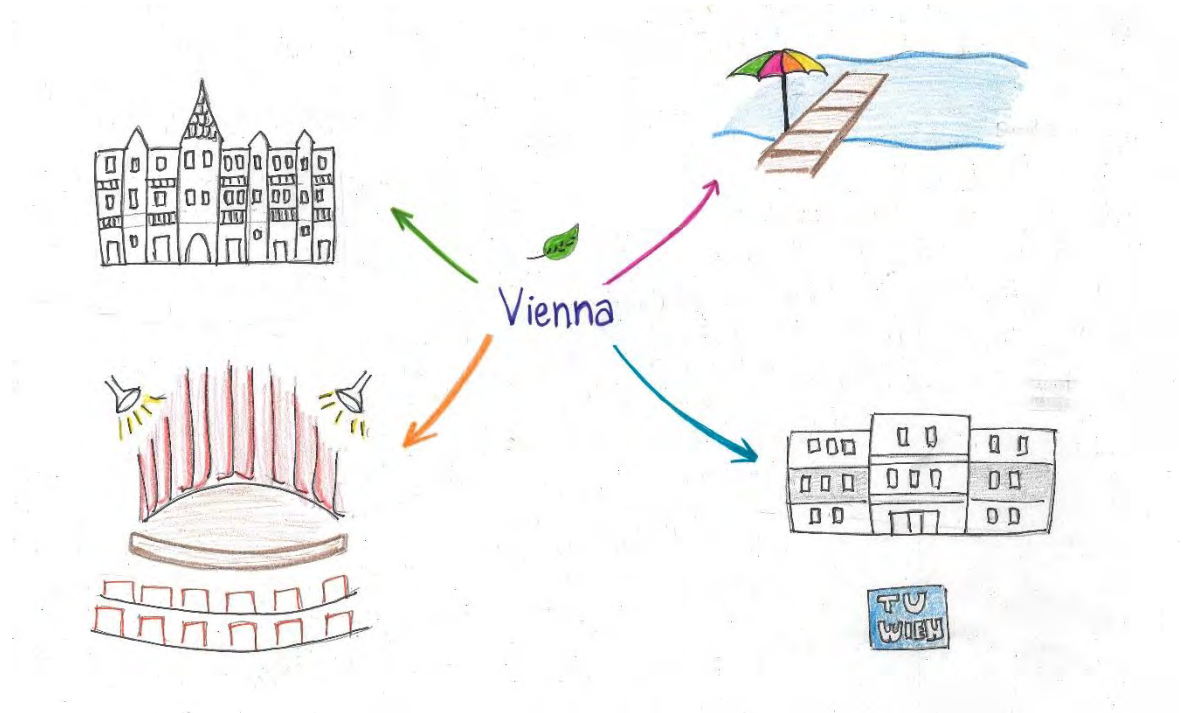
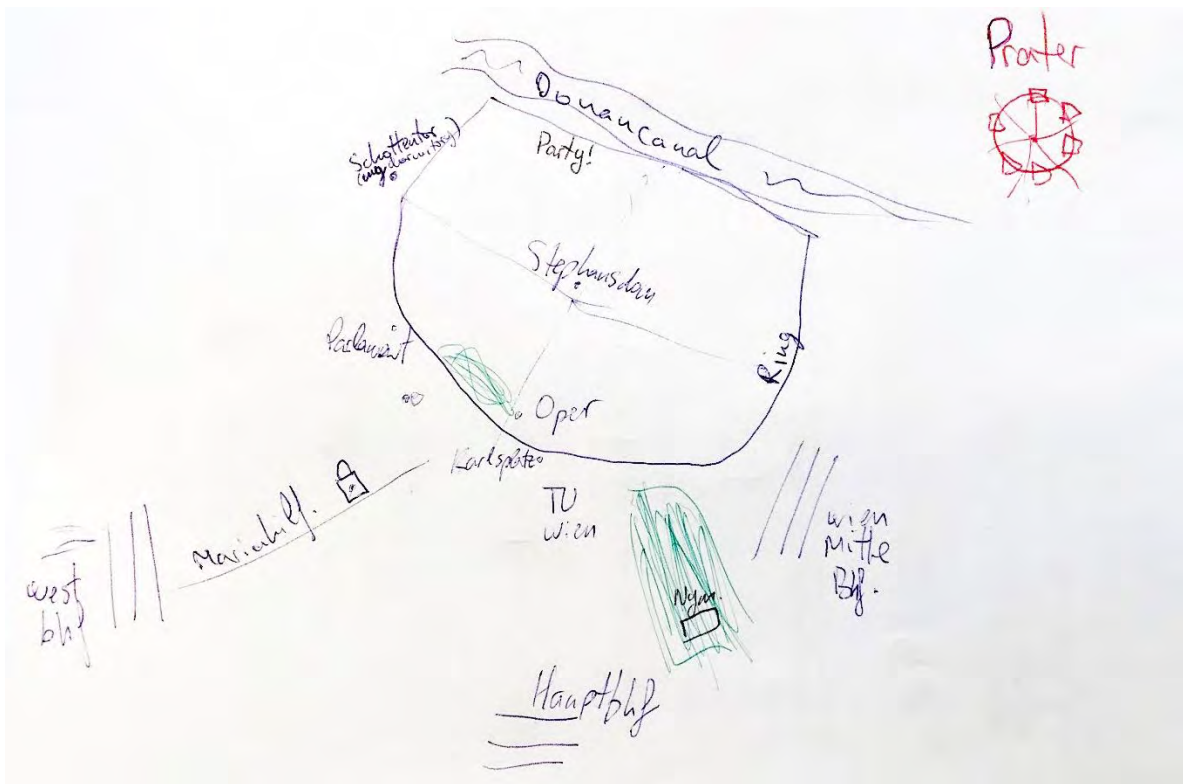


Ringstraße
 Eschenweg
 Betelshaus









B

Second user study

B.1 Introduction to the second user study

“Hello everyone and welcome to the Vienna city walk. My name is Mariam. I am a student of M.Sc. Cartography and currently writing a thesis at TUM. My research brought me back to Vienna and gave me an opportunity to meet you in person. Thank you very much for your contribution to and participation in my user study.

I will give a brief overview of our schedule. Before we start the walk, I would like to ask you to read the consent form. Then, I will ask you to complete a small questionnaire. Once we are done with the paperwork, we will start our walk through the streets of Vienna, we will visit some landmarks, and I will give you some facts, interesting stories, and personal memories about those places.

Between the stops, we will have some time to chat a little about Vienna and your impressions of the city. After the walk, we will have concluding paperwork. If you have any questions, please feel free to ask me...”

B.2 Participant consent form



Cartography M.Sc.

User study about the role of emotions in mental maps

Consent to participate in this user study

Thank you very much for finding time for the user study, which is conducted by Mariam Gambashidze, a Master student of the Technical University of Munich, with the supervision of Juliane Cron. It is organized within my work on the master thesis with the topic “The role of emotions in mental maps”. A short description of the study and how the data will be collected will be explained by the student.

Confidentiality and rights

This study is anonymous and is not aimed to retain any personal information. All the records and data gained from the test will be anonymized and used only within the work on my master thesis research. You may refuse to take part in the study at any time. You have the right to ask questions about this research study and to have those questions answered by me before, during or after the research.

Name: _____

Sex: m / f / x

Age:

Signature:

Date:

B.3 Questionnaire

Part I

Q1 Please give three keywords that represent your 'image' of the city of Vienna.

What do you associate with Vienna?

Q2 What landmarks do you associate with Vienna

Q3 My favourite places in Vienna are

Q4 Name a place in Vienna that is important to you.

Why is it important to you?

B.4 The PANAS

Part 2

PANAS questionnaire – BEFORE the ‘Vienna city walk’

The Positive and Negative Affect Schedule (Watson et al., 1988).

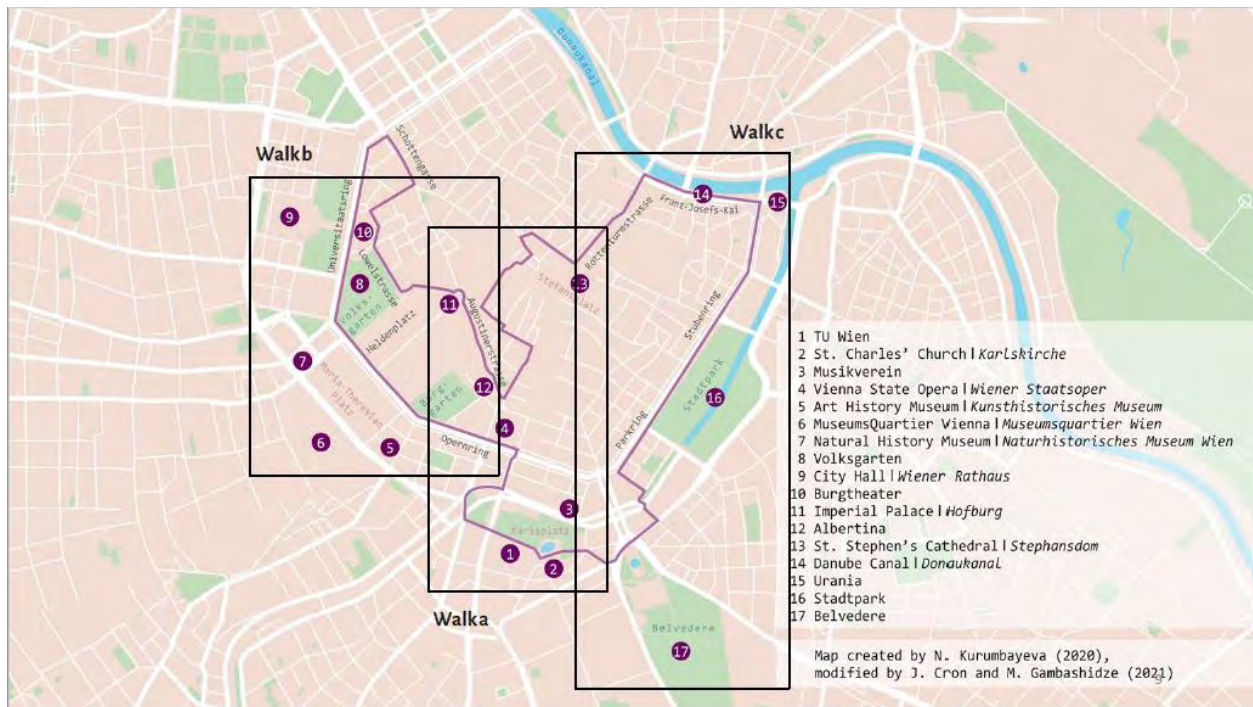
The PANAS scale consists of a number of words that describe different feelings and emotions. Read each item and then assign the number (1-5) from the scale below next to each word. **Indicate to what extent you feel this way right now, at the present moment.**

1	2	3	4	5
Very slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely
	___ Interested		___ Irritable	
	___ Distressed		___ Alert	
	___ Excited		___ Ashamed	
	___ Upset		___ Inspired	
	___ Strong		___ Nervous	
	___ Guilty		___ Determined	
	___ Scared		___ Attentive	
	___ Hostile		___ Jittery	
	___ Enthusiastic		___ Active	
	___ Proud		___ Afraid	

B.5 ‘Vienna city walk’ (on-site)

Part 3

The following scripts include the main narration about the landmarks and places, which were visited during each ‘Vienna city walk’. The numbering of landmarks correspond to their numbers on the map below (Map 1). Alongside the official facts (given in the scripts), other stories (marked with *), memories, experiences, and emotions related to visited places have also been shared by the interviewer with the participants. However, since they are personal and sensitive, these stories are excluded from the following narrations.



Map 1: three thematic routes of ‘Vienna city walk’

Walk a

I TU Wien

TU Wien with its Neo-Classical facade (1816) fronts on Ressel Park which contains busts and statues of famous 19th-century Austrian scientists and engineers. This part of the city around Karlsplatz became ripe for development once the threat of Turkish invasion has receded for good in 1683. The area is characterised by lots of Baroque around.

* *Coffee place*

2 Karlskirche

Karlskirche is one of Vienna's most impressive Baroque churches, with its beautiful carved columns and vast green dome. Karlskirche was built in the 18th century to thank God for delivering Vienna from the plague epidemic in 1713 (that claimed 8000 lives). Emperor Karl VI held a competition among architects to design the church. The result was a rich Baroque masterpiece with a gigantic dome (72m-high copper dome) and portico borrowed from classical architecture (from ancient Greece and Rome), while there are Oriental echoes in the minaret-like columns (embellished with various religious scenes). Pediment reliefs depict the suffering of Vienna's plague victims.

The building took almost 25 years. The interior is richly embellished with carvings and altarpieces by the foremost artists of the day. The dome is rich with frescos. There is an elevator that brings you under the cupola. The pond in a flower-strew Resselpark reflects the splendour of a church like a mirror.

* *Surrounding of Karlskirche in former times*

3 Musikverein

Vienna is tightly connected to classical music and is often referred to as the world's musical capital. Public concert life in Vienna began with the foundation of the Society of Friends of Music in 1812; up until then, concerts were restricted to aristocratic homes. The society's aim was, and still is, to promote music in all its facets. This magnificent concert hall in Greek style was built in 1869 for the Society of Friends of Music.

The concert hall, which is home to Vienna Philharmonic Orchestra, is a mixture of styles employing terracotta statues, capitals, balustrades and a lavish interior. It holds the proud title of the best acoustics of any concert hall in Austria. Musikverein became world-famous after the Vienna Philharmonic Orchestra began giving its annual New Year's Day concert in 1941.

* *Standing room tickets and related facts*

4 Staatsoper

*** [introductory information] Emperor Franz Joseph commissioned the major institutional buildings of the Habsburg empire and the city along the Ringstrasse in the mid of 19th-century. Today these buildings remain a successful and imposing example of good urban planning.

The art-loving Habsburgs functioned as paymasters and provided the perfect setting for a flourishing musical landscape, particularly from the late 18th to the 19th centuries. Vienna's State Opera House was the first of the grand Ringstrasse buildings to be completed. It opened in 1869 to the strains of Mozart's Don Giovanni.

Built-in Neo-Renaissance style, Opera House initially failed to impress the Viennese. New Opera House did not appeal to Emperor Franz Joseph either, who referred to it as a "railway station". Another nickname earned by this building was a "stone turtle". The foyer of Opera is graced with the busts of Beethoven, Schubert, Haydn and frescos of celebrated operas. Gold and crystal interior. In 1945 building was largely destroyed by the bombs of World War II. The Opera House reopened fitted with new technology in 1955 with a performance of Beethoven's Fidelio.

Vienna's foremost opera and ballet venue has witnessed many world-famous works and house some of the most iconic directors in history (including Gustav Mahler, Richard Strauss, etc.). The stage raises the curtain on over 300 performances each year. Next to Operas, countless ballets are performed here. Productions are lavish, formal affairs, where people dress up accordingly. Interestingly Viennese opera audience is infamous - spirited applause, as well as loud booing, are part of the experience.

Once a year, the legendary Vienna Opera Ball takes place. On the last day of Vienna Carnival, the stage is extended to cover the seats in the auditorium to create space for Opera Ball (February, one of the grandest balls of Fashing; takes place on the Thursday before Ash Wednesday). The opening ceremony includes a performance by the Opera House ballet.

* *High demand on opera tickets*
Famous Kaesekrainer place

12 Albertina

One of the World's largest and most valuable collections of graphic art is gathered in Albertina Palace, which is named after its funder Duke Albert of Sachsen-Teschen (1738-1822). Once used as Habsburgs' imperial apartments for guests, the Albertina is now home to a collection of graphic art, architectural drawings and photographs from all periods. The 65 000 drawings and almost one million prints include works by Albrecht Durer, Gustav Klimt, Michelangelo, Rubens, Monet, Picasso, Degas, Cezanne, Matisse, Chagall, and many more.

Albertina's permanent collection (covering the period from Monet to Picasso) is one of the most significant private collections in Europe. Besides the permanent Batliner Collection, the museum hosts temporary high-quality changeable exhibitions. Except for the art masterpieces, the Habsburgs State Rooms are also open to the public. They represent a remarkable example of Neo-Classical architecture and interior decoration.

* *A story about the flood and the robot*

11 Hofburg

The Hofburg, Vienna's former Imperial Palace, is one of the most spectacular and lavish palace complexes spread over a considerable area within the city centre. Modest city fortress (13th century) has grown over the centuries (700 years) into a vast palace. Once home to emperors, the medieval castle was enlarged gradually and every emperor left its imprint up until Habsburgs fell from power in 1918. As the power of Habsburgs grew, successive emperors added buildings in contemporary styles.

Today the vast Hofburg complex houses former imperial apartments, several museums, a chapel, a church, the Austrian National Library, the Spanish Riding School, the President of Austria's offices, and stately public squares. Seven centuries of architectural development can be seen in the buildings, ranging from Gothic to late 19th-century historicism. The monumental Hofburg palace complex includes courtyards and elegant gates, statues of the Habsburg rulers, impressive squares where many people stroll through the palace complex.

* *Globe Museum, a part of the Austrian National Library*
 Citizens who had previously lived in Hofburg
 Vienna Boys' Choir
 Gates of Hofburg

13 Stephansdom

Vienna's spectacular gothic cathedral sits at the heart of the city and dominates the skyline. The Romanesque church dates back to the 12th century, but the earliest surviving features today are the 13th century. Various Habsburg rulers left their imprints by rebuilding parts of the church in the 14th and 15th centuries. Since when the Stephansdom began receiving its Gothic makeover. The "Steffl", as the cathedral is lovingly called by the Viennese, suffered severe damage from World War II bombings, but its rebuilding was a symbol that the country emerged from the ashes of the conflict.

Highlights of the cathedral include South Tower, Riesentor and Heidentrume, North Tower, tiled roof, interior, treasure, and catacombs. South Tower grew very high and reached 136.7 m in the 15th century. Today visitors can ascend the 343 steps to a small viewing stage and enjoy one of the most spectacular views over the rooftops of Innere Stadt of Vienna. The earliest surviving features today are the romaneseque Riesentor (Giant Gate; named after a mammoth's bone that was found on the site during construction works in the 15th century) and Heidentrume (Towers of the Heathens) at the entrance and above it which are reminders since 12th century. Riesentor is packed with basilisks, fearsome dragons and lions. It is Eldorado for animal lovers. North Tower according to the legend has never completed, as its master builder, broke a pact he had made with the devil by pronouncing a holy name. The Devil then caused him to fall to his death. North tower is the home of Austria's largest bell named "Pummerin" or "Boomer". The original bell was made from melted-down cannons abandoned when Turks fled Vienna in the 17th century. The Bell crashed down through the roof in 1945 when fire swept through the Stephansdom, so a new and even larger bell (weighing nearly 20 tones, using the remains of the old one) was installed in the 68.3m-high north tower in 1957. The impressive tiled roof is covered with almost a quarter of million glazed colourful tiles; a double-headed eagle wearing emperors crown and the golden fleece. Originally constructed in 1490, the roof was restored after fire damage in World War II. Inside the cathedral are spectacular arts such as gothic stone pulpit, baroque high altar, five colourful medieval windows, cathedral treasures (religious art pieces spanning more than 1000 years), and catacombs. Emperor Karl VI closed the cathedral cemetery in 1732 and since then a catacomb system was constructed to bury the city's dead. The centrepiece of the Duke's crypt holds the remains of Habsburgs.

* *Discovery of a new wall-painting in Stephansdom*
When Pummerin rings

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Walk b

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* *A story about the flood and the robot
Famous Kaesekrainer place*

5 Kunsthistorisches Museum

*** [introductory information] Emperor Franz Joseph commissioned the major institutional buildings of the Habsburg empire and the city along the Ringstrasse in the mid of 19th-century. Today these buildings remain a successful and imposing example of good urban planning.

Build in the style of the Italian Renaissance Kunsthistorisches Museum was opened in 1891. Its completion meant that, for the first time, most of the imperial collection of art was housed under one roof (originally the works of art were housed in the Hofburg and the Belvedere). Habsburgs have been enthusiastic patrons and collectors of art and artefacts for centuries. The collections of the museum are housed inside a majestic neoclassic building and the museum takes you on a time-travel treasure hunt - from classical Rome to Egypt and the Renaissance. The imperial art collection includes one of the world's finest gatherings of works by the Old Masters. More than 1.5 mln people visit the Museum of the History of Art every year.

* *A story of the stolen Saliera*

7 Naturhistorisches Museum

Almost the mirror image and the identical twin of the Kunshistorisches Museum, the Natural History Museum was designed by the same architects and opened in 1889. The fascinating collections of natural history, geology, and archaeology have grown out of Emperor Franc Stephan's (1748) collection of natural curiosities. The collection of the museum covers 4 billion years of natural history in a blink. They are quite wide-ranging and include archaeological, anthropological, mineralogical, zoological and geological displays. Visitors can discover casts of dinosaur skeletons, the world's largest display of skulls illustrating the history of man, one of Europe's most comprehensive collections of gems, prehistoric sculptures, Bronze Age items, extinct birds and mammals, and a planetarium. Museum has a splendid interior with its stuccoed halls and eye-catching cupola. The museum counts up to more than 20 million exhibits and is often voted as the world's top 10 museums.

* *A story of misplaced statues on the tops of museums*

6 Museumsquartier

The baroque building that was once home to the emperors' horses and carriage houses (designed in 1725) is today one of the world's largest museum complexes. This historic complex turned into a huge cultural centre and opened in 2001. The complex houses various museums and galleries (such as Leopold Museum, the Museum of Modern Art, Kunsthalle, Architekturzentrum Wien), venues for film, theatre, dance, new media and children's creativity centre, as well as a variety of shops, cafes. It is one of Vienna's hotspots with over 20 different cultural institutions.

The main courtyard of Museumsquartier is often called the largest open-air festival hall in Vienna. It hosts winter and summer program events from film festivals to Christmas markets and DJ nights. From here the diverse architecture of the complex can be appreciated. MQ combines baroque buildings and contemporary architecture. The colourful chairs in the huge courtyard have reached cult status in their own right: the "Enzis". The Enzi furniture has been part of the furnishing of the courtyard in the MQ since 2002. Since 2010, the courtyard furniture in the MQ has been supplemented by the "Enzo" (2010 to 2013) and "Viena" models (in use since 2013). The colour was determined annually until 2010. Since then, the colour has been changed every two years and determined via online voting. In 2020 Dragonfly (green) was chosen. The MQ courtyard furniture in the new colour is set up in the main courtyard at the beginning of the "courtyard season". Older models can be found inside courtyards or are sold "ex-yard".

* *Musical walls of MUMOK
Citizens living in Museumsquartier
Image of Museumsquartier before and now*

9 Rathaus

The Neo-Gothic town hall with its spires, stone rosettes in the pointed windows and loggias was completed in 1883 to express the inhabitants' pride in their city at that time. The new Town Hall is the seat of the Vienna city and Provincial Assembly.

The impressive building has seven arcaded courtyards and over 1 500 rooms. A huge central tower, 100m high is topped by the 3m statue of a knight in armour with a lance. Attractive features are delicate tracery, carved balconies, and barrel-vaulted Festsaal (Festival Hall) which hosts the Concordia Ball in June. Here can be found reliefs of composers Mozart, Haydn, Gluck and Schubert and Stadtsitzungsaal (Council Chamber) frescos depict historic events such as the foundation of the university in 1365. In front of the building is the wide Rathaus Park. All year around various festivals take place on the square in front of the Rathaus, ranging from a Christmas market to a music film festival in summer.

* *Musikfilm-Festival at Rathausplatz*

10 Burgtheater

The most prestigious stage in the German-speaking world, staging some 800 performances a year, from Shakespeare to modern works. The theatre company dates to 1741, making it Europe's second oldest. The original theatre built in Maria Theresa's reign was replaced in 1888 by today's renaissance-style theatre building. It closed for refurbishment in 1897 after the discovery that the auditorium had several seats with no view of the stage.

During World War II the bomb devastated the building, leaving only the side wings. The central part of the Burgtheater was rebuilt in 1952-1955 after war-damaged, but the auditorium is still decorated in the imperial colours of cream, red and gold. The last restoration was carried out in 1995. Burgtheater has a ceiling fresco by Klimt, which is a part of the series "The History of the Theatre". The walls of Burgtheater have hosted musical milestones such as the premiere of Mozart's *The Marriage of Figaro* (1786), Beethoven's *First Symphony* (1800).

* *Standing room of Burgtheater*

8 Volksgarten

*** [introductory information] Streets around the Hofburg are no longer filled with the carriages of the nobility. Most of the places have become offices, embassies, or apartments. Yet this district remains most fashionable in Vienna, crammed with elegant shops, art galleries, coffee houses, which offer an enjoyable interlude between

visits to many museums and churches in this area. Former gardens of the Hofburg palace are now open to the public and some of the buildings around are splendid museums now. This area is bustling by tourists by day, but at night almost deserted.

Volksgarten was created after the destruction of the city walls by Napoleon, and open up space previously occupied by fortifications. It was open to the public soon after its completion in 1820. It stretches between the Burgtheater and Heldenplatz and is popular with both students from the nearby universities and businessmen for a lunch break. Locals flock here especially in summer to picnic or simply relax. Volksgarten has beautiful rosebeds, which bloom in spring. The replica of Athens' Temple of Theseus is a neo-classical building by the court architect (1813-1823), built for the sculpture of Theseus. Since the Kunsthistorisches museum has been built, the sculpture was moved there and the Athen's temple hosts a range of changing exhibitions, namely exhibitions of contemporary artists' works.

* *Beloved place of citizens*

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Walk c

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* *Discovery of a new wall-painting in Stephansdom*
When Pummerin rings

14 Donaukanal

The Danube formed an extensive landscape of small islands before it was regulated into a men-made bed in 1870 to prevent flooding. The river which runs around the edge of the city centre is not the actual Danube, but one of its many arms, the Danube Canal. Since the “beautiful blue Danube” in Vienna is located rather far away and does not run directly through the city, the Danube Canal has taken over as the “city river”.

Around the turn of the century, the canal was of ill repute as being proletarian paradise - making it undesirable for the bourgeois society. This remained as a case until 2010. Only recently Danube has been discovered and used as a leisure area that runs through the heart of the city. Along the promenade, popular with walkers, cyclists and in-line skaters, there is a lively colourful mix of pub and restaurant scenes. Here many Viennese enjoy summer nights and walk along the banks. There is something for every taste. It is a great place to discover a ton of graffiti and street art. From here one can even take a boat to Bratislava, Vienna’s close Slovakian neighbour.

* *Graffiti and artists’ gardens around Donaukanal*

15 Urania

The Urania which was built as a planetarium is named after a muse to astronomy in Greek mythology. The art-nouveau style Urania we know today was built in 1909. It was opened by Franz Joseph I as an educational facility with a public observatory.

The main architect was Max Fabiani, a student of Otto Wagner. The unconventional shape and style of the building scandalized the Viennese at first (as usual) but time by time it was fairly quickly embraced as a new landmark of the city.

During World War II Urania was severely damaged and the dome with the observatory was destroyed. After its reconstruction, Urania was reopened in 1957. Today Urania serves many different functions. It continues to be the public observatory in Austria (the oldest one), hosts wide-ranging classes and lectures in its seminar rooms, as well as famous puppet theatre and cinema, where the annual Viennale movie festival takes place. Urania also houses a restaurant and café.

* *What Urania includes nowadays*
Cinema with the widest seats
Puppet theatre

16 Stadtpark

Laid out on either side of river Wien, Stadtpark was inaugurated in 1862 as the first public park in Vienna. The recreation space was designed in an English landscape style. Due to the diversity, nearly the whole year some of the plants are blossoming. A few of them are even protected due to nature conservation. The river Wien splits the Stadtpark into two parts and bridge constructions connect both parts. Stadtpark links the city centre and the third district. It is the biggest park area in the centre of the city, but well protected by the surrounding noise of the Ringstrasse.

Kursalon was built in Stadtpark in 1865-1867 as a spa pavilion where mineral water with healing properties was served. In the beginning, amusements were prohibited in this Italian renaissance building. However, since that concept was not accepted, it was changed, and Johann Strauss II gave his first concert here in 1868. The Kursalon thus became a popular place for concerts. Today, it is still used for balls, concerts, nightclub events, and congresses. There is also a Café-Restaurant inside it.

The park includes several pools, fountain installations and many monuments for musicians, composers, artists, and writers. In Stadtpark the most famous monument is the gold plated bronze statue of Johann Strauss - "King of Waltz". Stadtpark is equally well-liked by the tourists and the Viennese citizens, who are already enjoying here the first warming sun rays.

* *A story of a duck, ducklings and police officers*
Beloved place of school students
Stadtpark before and now

17 Belvedere

Belvedere, the shining example of Baroque style, was built as the summer residence of Prince Eugene of Savoy. Prince Eugen of Savoy, the most celebrated of the Habsburg generals due to his defeat of the Turks in 1683, commissioned the two Belvedere palaces (Upper and Lower). With the money, he received as a reward for his victories he started the most ambitious building projects ever undertaken by a private individual. Prince had grown up around the court of Louis XIV and therefore his palaces show the character of Versailles. Prince Eugene was an avid hunter, a passionate collector of fossils and shells, a keen gardener and a budding zoologist. He brought a touch of exotica to the Belvedere gardens filling them with rare plants from across the globe. This area has also housed among other animals a lion, an Indian wolf, fallow deer, etc.

Belvedere is situated on a gently sloping hill and consists of two 18th-century palaces linked by Symmetrical and finely sculpted gardens laid out in French style. The garden is sited on three levels, the lower part represents the domain of Four elements, the centre is Parnassus and the upper section is Olympus. Standing

at the highest point of the garden, Upper Belvedere has a more elaborate facade than the lower Belvedere. Impressive baroque interiors of the building house now an Austrian art collection with works ranging from the Middle Ages to the present day (including masterpieces of Medieval and Modern Art, Klimt to Baroque, impressionists and Romantics).

Lower Belvedere housed the Museum of Austrian Art but now displays temporary exhibitions only. The facade of this impressive baroque palace is adorned with iconic columns and statues. The lower belvedere also incorporates the Orangery (originally used to shelter tender garden plants in winter, now transformed into an exhibition hall) and the palace stables (exhibits 150 items of medieval art). The upper Belvedere is referred to as the most famous balcony in Austria, which provides skyline, Stephansdom and Hofburg views. This explains its Italianesque name - belvedere which means the “beautiful view”.

* *Canaletto view from Belvedere*
Citizens living in Belvedere
Botanical garden

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B.6 ‘Vienna city walk’ notes

Date

Number of Participants

Walk ☐ a ☐ b ☐ c

Influencing factors

Weather condition:

Distractions:

Altering the route:

Altering the script:

The mood of the group:

Additional Comments:

Walk duration

Total time of the stud

walk a

Date	26.05.2021	29.05.2021
Tour Number	walk a1	walk a2
Number of Participants	5	4
Influencing Factors		
Weather Condition	Sunny	Sunny
Destructions	None	Mobile phone
Altering the Route	No	No
Altering the script	No	No
Mood of the group	Positive, Engaged	Positive, Concentrated

walk b

Date	28.05.2021	07.06.2021	11.06.2021
Tour Number	walk b1	walk b2	walk b3
Number of Participants	5	3	1
Influencing Factors			
Weather Condition	Cloudy	Sunny	Sunny
Destructions	Manifestation	Ice cream break	None
Altering the Route	No	Little	Little
Altering the script	Little	No	Little
Mood of the group	Positive, Engaged, Concentrated	Positive, Concentrated	Positive, Interested

walk c

Date	26.05.2021	28.05.2021
Tour Number	walk c1	walk c2
Number of Participants	4	4
Influencing Factors		
Weather Condition	Sunny, Windy	Cloudy, Windy
Destructions	None	Manifestation
Altering the Route	No	Yes
Altering the script	Little	No
Mood of the group	Positive, Talkative	Positive

B.7 Instructions for mental map drawing

“Here ends our walk. I hope you have enjoyed it.

I have guided you through some landmarks, places, facts, and personal stories related to some parts of my image of Vienna. Now I would like to ask you to draw your mental map of Vienna, which you can enrich with your mental images, landmarks, stories, emotions, etc. Feel free to be creative. You have roughly 20 minutes for this mapping task. In case you have any questions, you can ask me at any point.

Thank you very much and I wish you a happy mapping...”

B.8 The PANAS

Part 4

PANAS questionnaire – AFTER the ‘Vienna city walk’

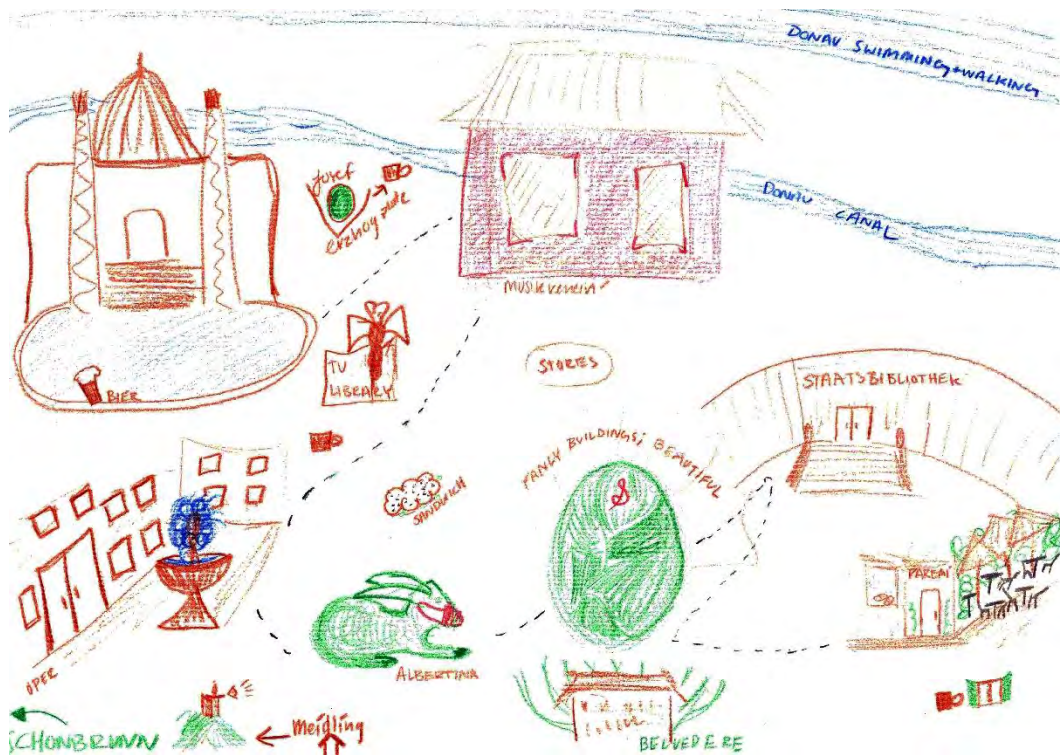
The Positive and Negative Affect Schedule (Watson et al., 1988).

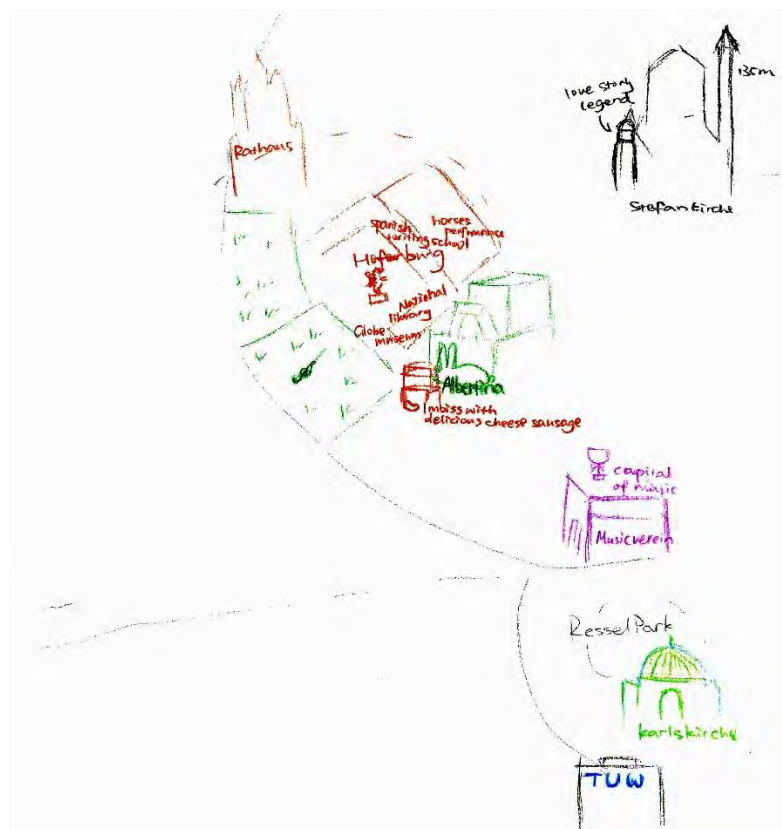
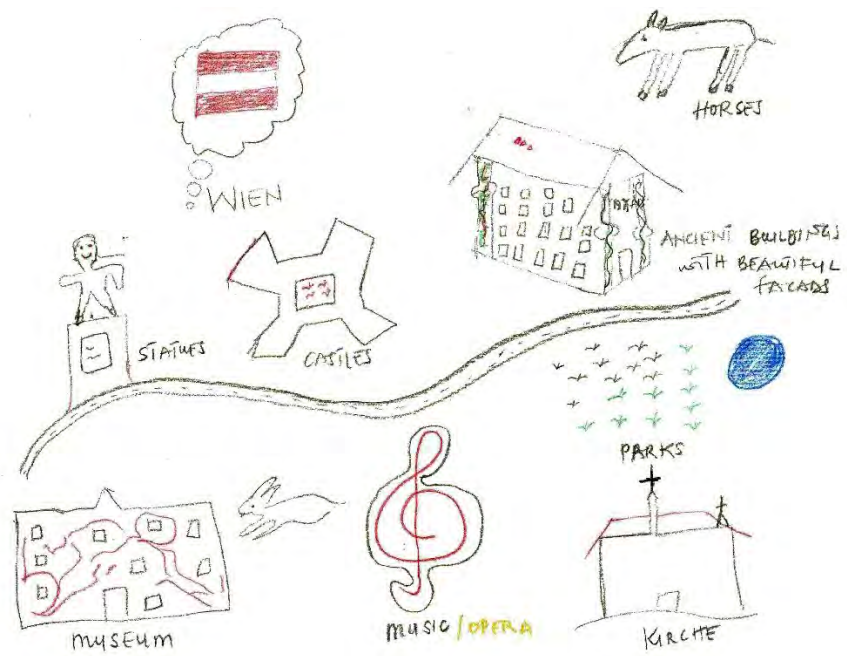
The PANAS scale consists of a number of words that describe different feelings and emotions. Read each item and then assign the number (1-5) from the scale below next to each word. **Indicate to what extent you feel this way right now, at the present moment.**

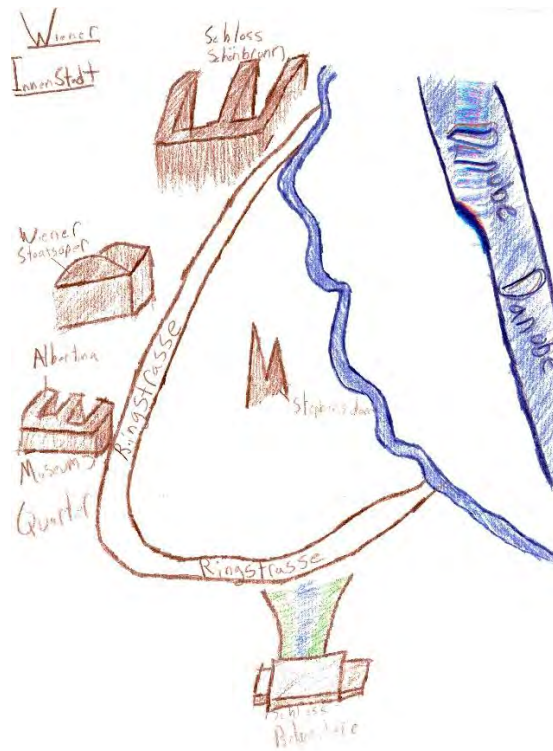
1	2	3	4	5
Very slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely
	___ Interested		___ Irritable	
	___ Distressed		___ Alert	
	___ Excited		___ Ashamed	
	___ Upset		___ Inspired	
	___ Strong		___ Nervous	
	___ Guilty		___ Determined	
	___ Scared		___ Attentive	
	___ Hostile		___ Jittery	
	___ Enthusiastic		___ Active	
	___ Proud		___ Afraid	

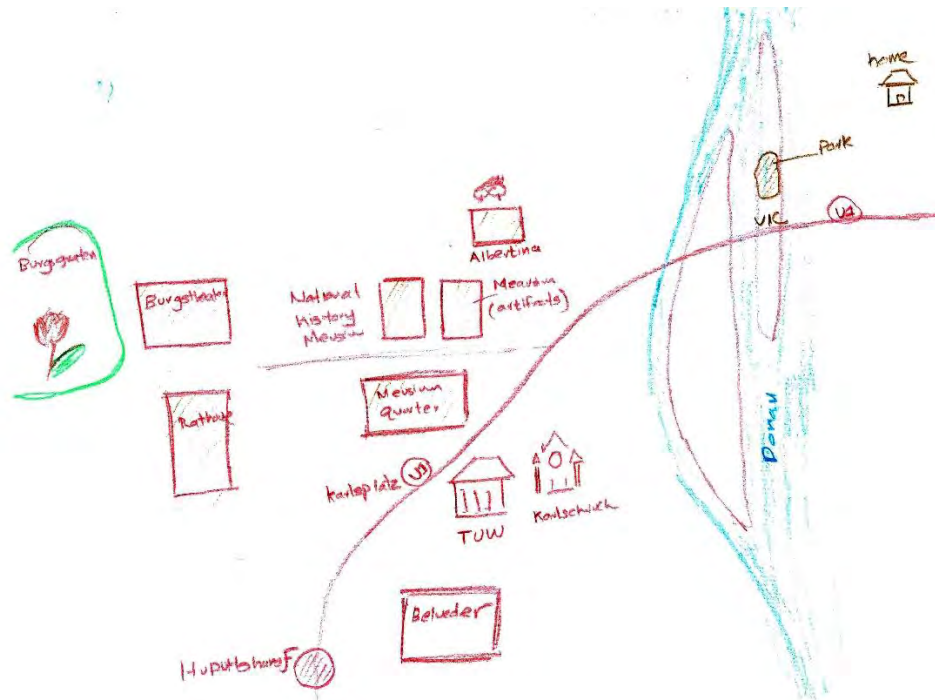
B.9 Mental maps

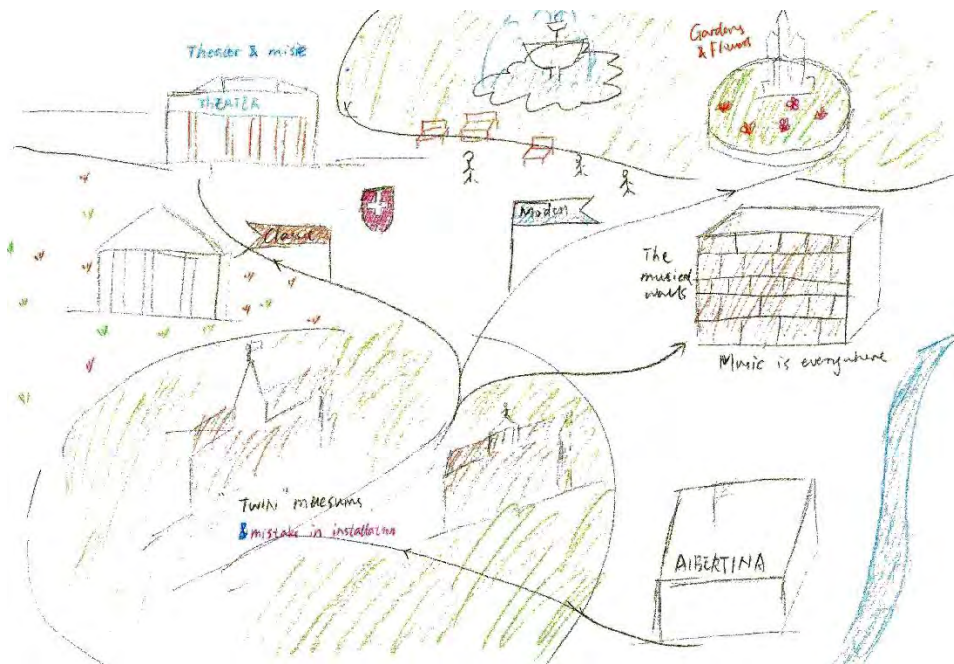
Part 5

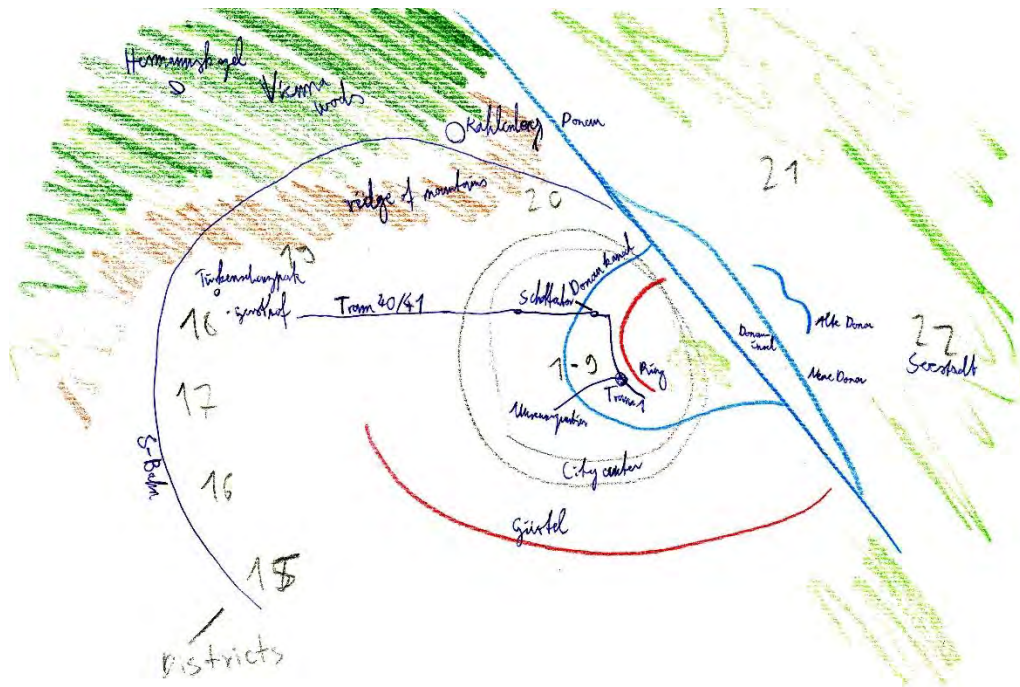
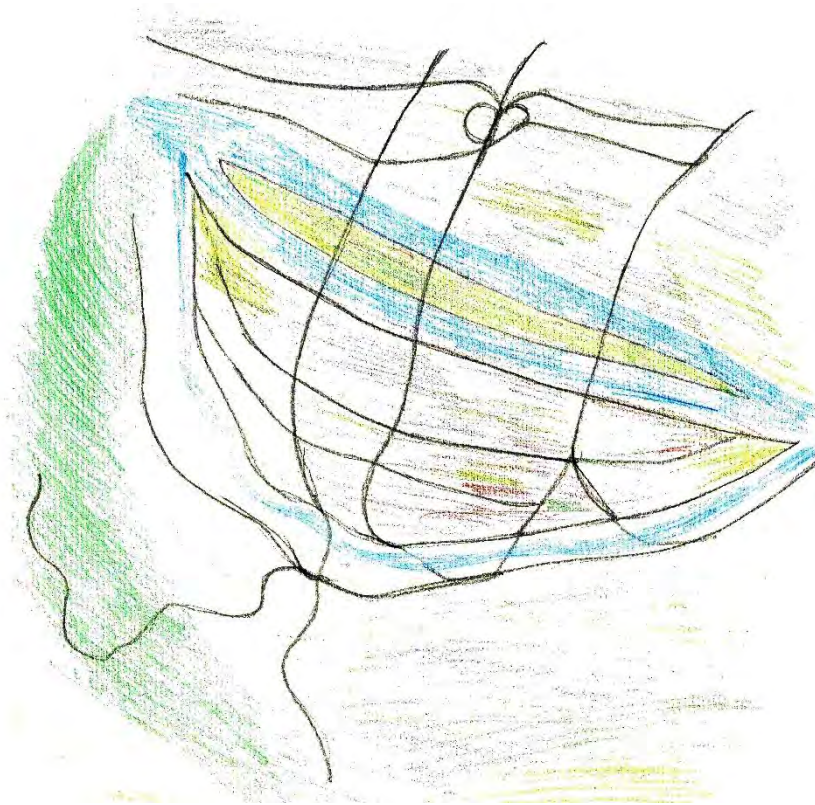


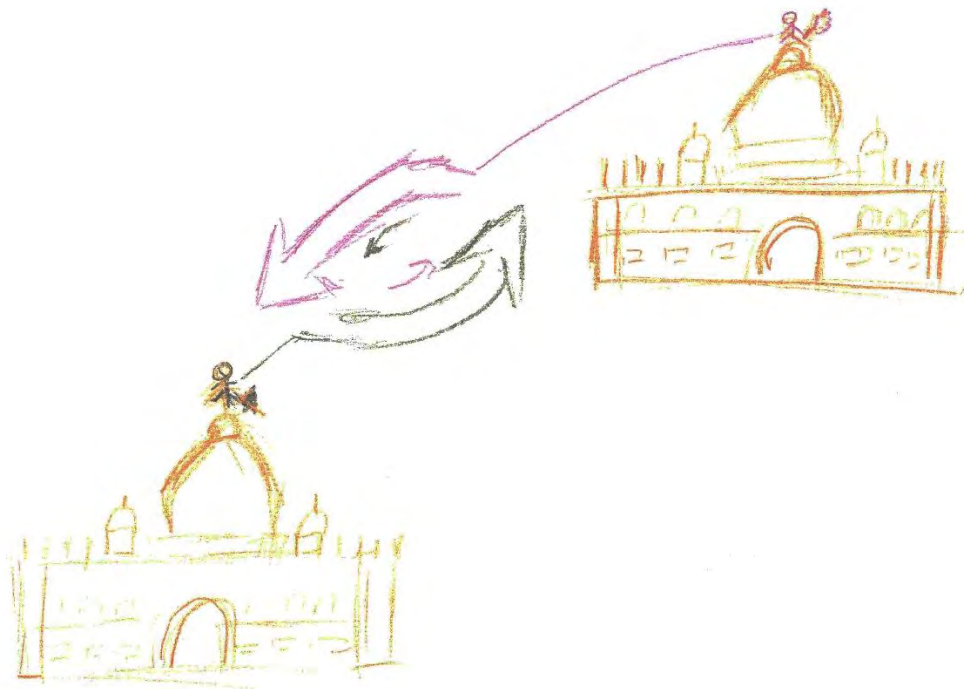
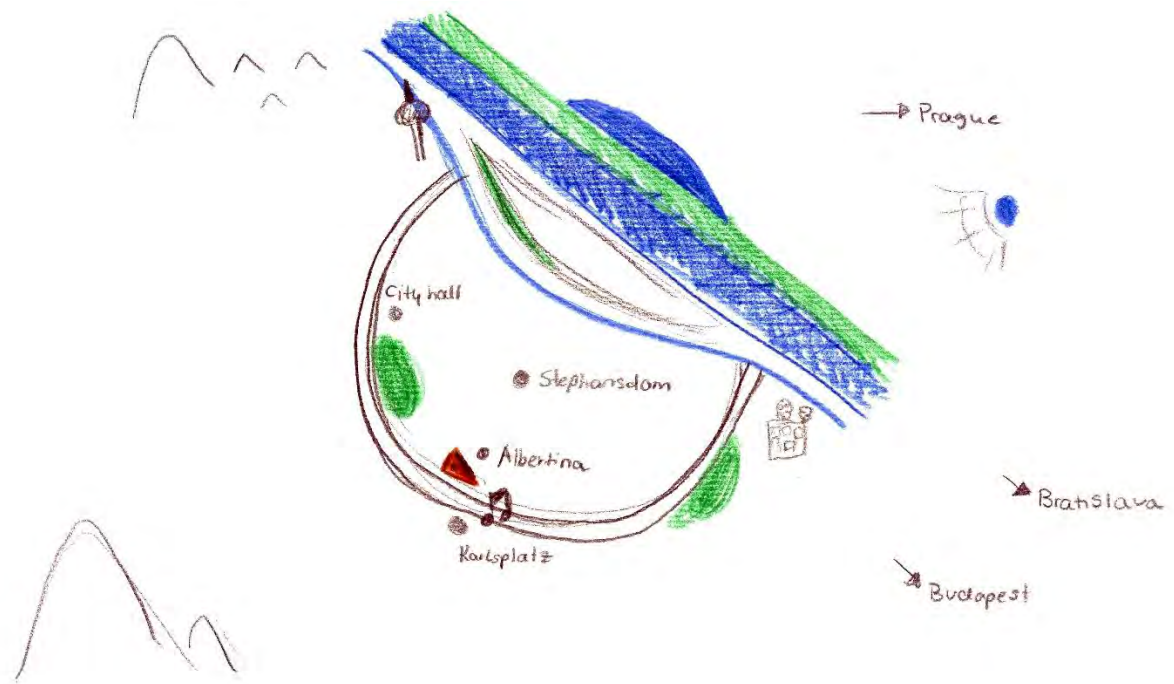


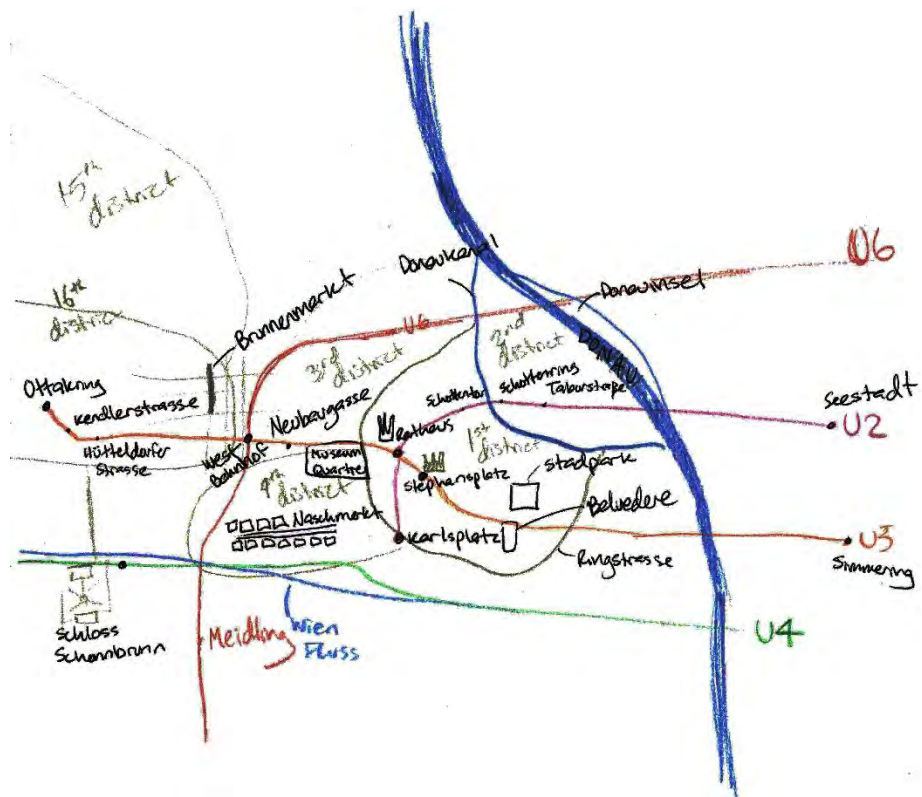




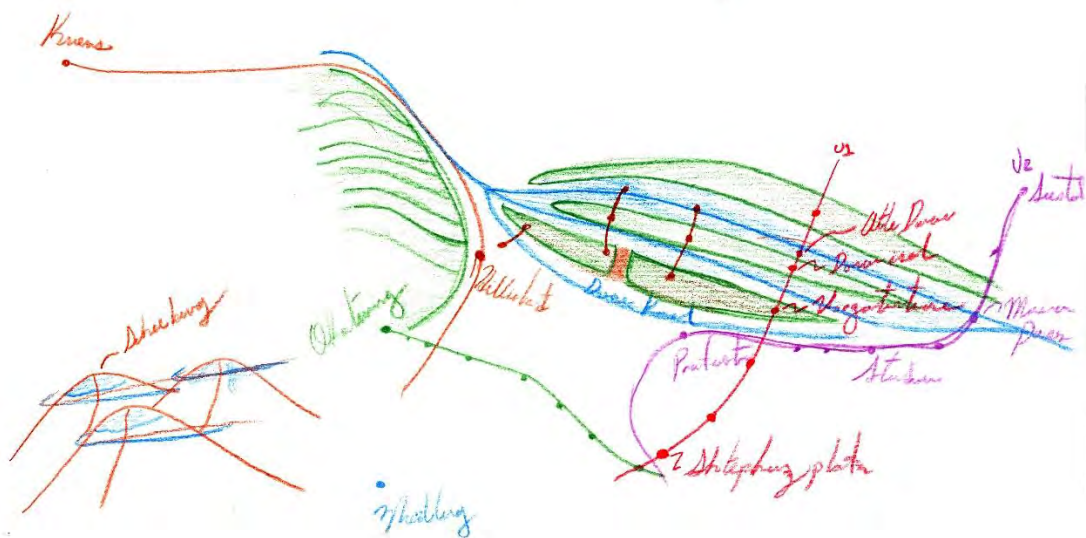


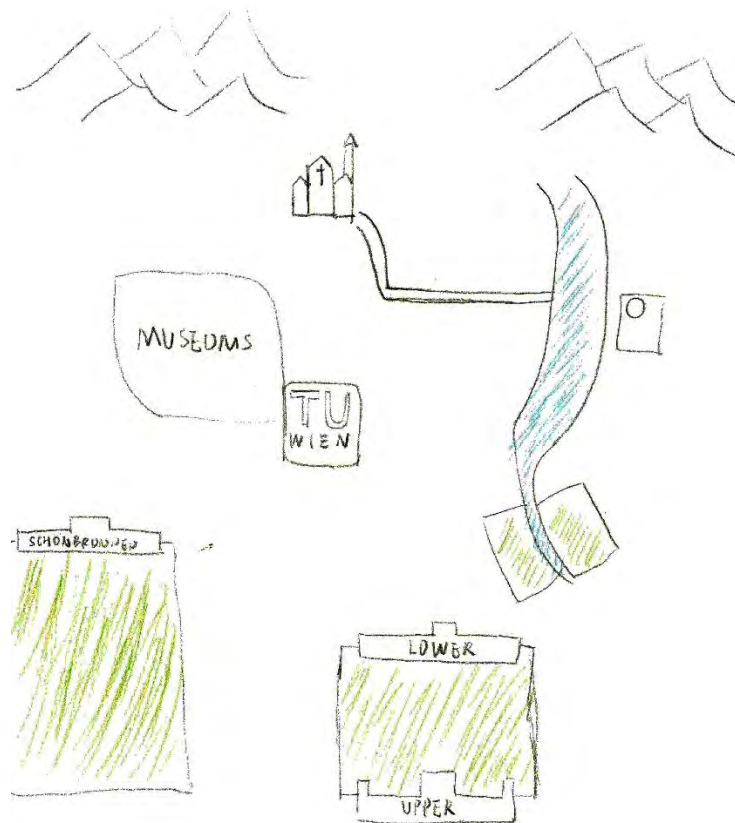
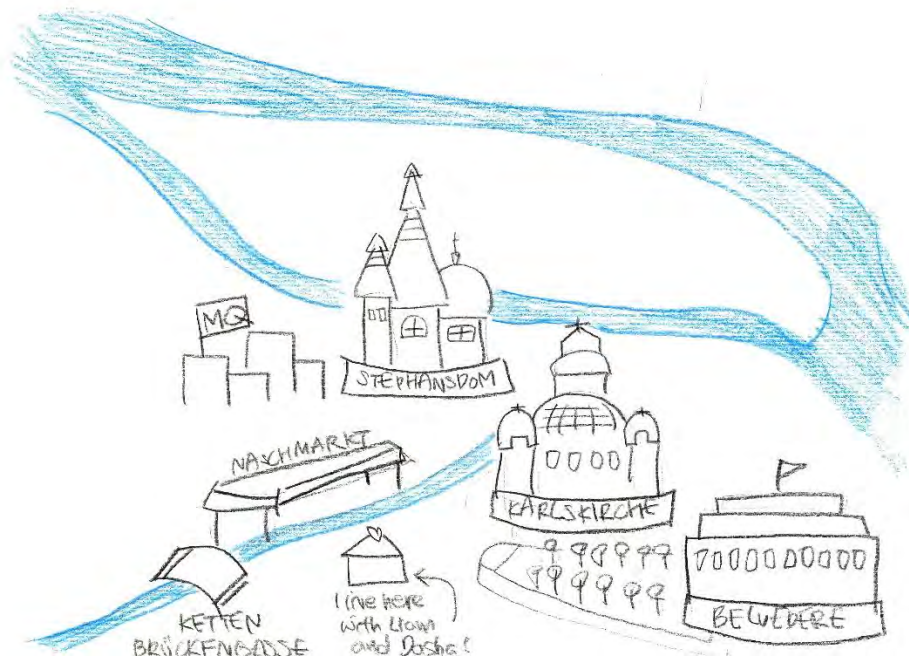


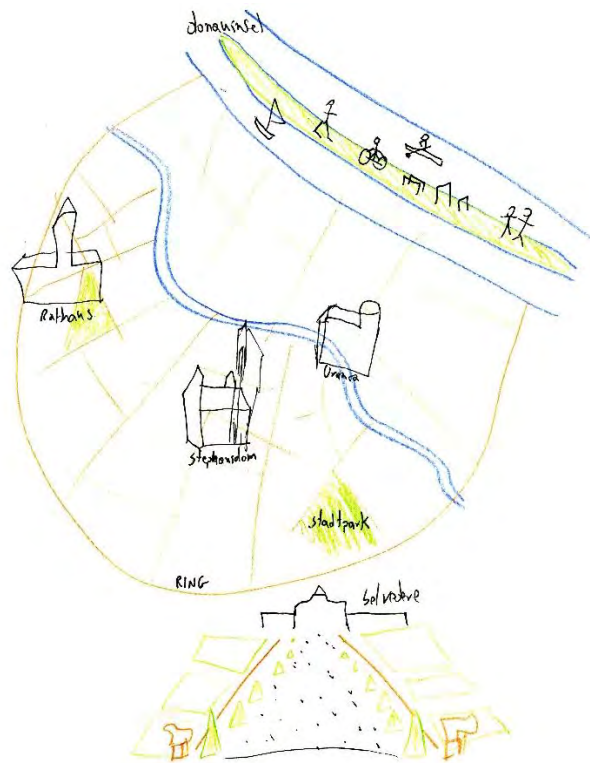


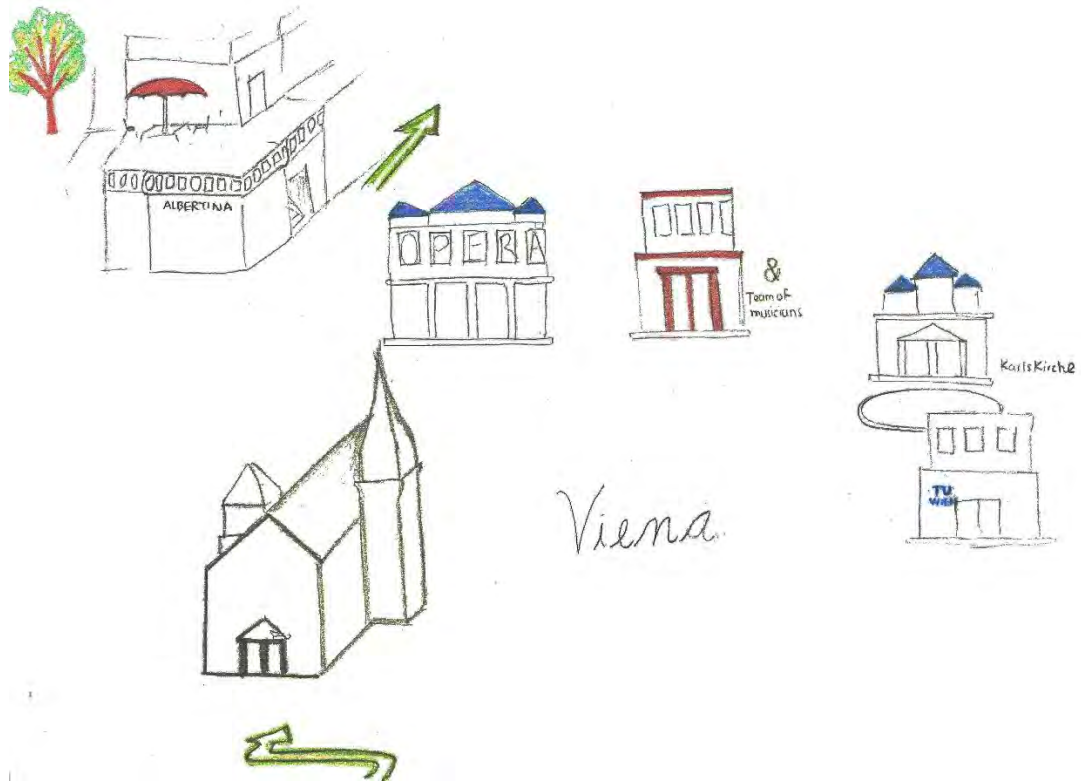


Vienna









B.10 Questionnaire

Part 6

Q5 After the 'Vienna city walk' and creating a mental map		yes	no	do not know
	I have learnt something new about the city			
	I am more curious to further explore the city			
	I feel a greater connection to the city			
	Nothing has significantly changed			

Q6.a My current ' <u>image</u> ' of Vienna has been influenced by		yes	maybe	no
	'Vienna city walk'			
	Narrated facts			
	Shared personal experiences/stories			
	Other (please name) _____			

Q6.b My <u>emotions</u> (towards places) have been influenced by		yes	maybe	no
	'Vienna city walk'			
	Narrated facts			
	Shared personal experiences/stories			
	Other (please name) _____			

Rate the following by giving them numbers from 1 (**very influential**) to 5 (**not influential**)

Q7.a My current ' <u>image</u> ' of Vienna has been influenced by		1	2	3	4	5
	'Vienna city walk'					
	Narrated facts					
	Shared personal experiences/stories					
	Other (please name) _____					

Q7.b My <u>emotions</u> (towards places) have been influenced by		1	2	3	4	5
	'Vienna city walk'					
	Narrated facts					
	Shared personal experiences/stories					
	Other (please name) _____					

Q8 What did you enjoy the most while creating your mental map?

Q9 What was for you the hardest part of creating your mental map?

Thank you very much =)

B.II Interview

Part 7

Date

Participants

First mental map (1) ☐

Second Mental map (2) ☐

I General

a. Had you ever been to Vienna before your 2nd semester?

As a tourist or for any other reasons?

How long had you spent previously in Vienna?

2 Meanings and visual language

Mental map 1

a. Tell me a bit about your mental map (1)¹²

Why have you drawn these elements?

Which ones have the most personal meaning to you?

b. Did you depict the surroundings closer to where you live on your mental map (1)?

Why?

¹² What does it show? what is it about?

c. Your map elements (1) are not at the same scale, why?¹³

d. My colour choice in the mental map (1) depends on

if more than one answer applies, please order them by assigning numbers (1=most important reason, etc.)

	mark the answer(s)	order the answers
favourite colours		
logical associations (e.g. parks green, etc.)		
subjective associations		
artistic vision		
I did not use colours for any specific reasons		
other (please name) _____		

f. Did you include the following in your mental map (1)?

map 1	yes	maybe	no	examples/comments	visualisation (G-T-C-O) ¹⁴
landmark(s)					
my favourite place(s) ¹⁵					
important place(s) for me ¹⁶					
associations					
emotions					
other _____					

¹³ Ask in case, if the map elements have different scales

¹⁴ G = graphic elements, T = text, C = colour, O = other

¹⁵ In case of having such

¹⁶ In case of having such

Mental map 2

a. Tell me a bit about your mental map (2)¹⁷

Why have you drawn these elements?

Which ones have the most personal meaning to you?

b. Did you depict the surroundings closer to where you live on your mental map (2)?

Why?

c. Your map elements (2) are not at the same scale, why?¹⁸

d. My colour choice in the mental map (2) depends on

if more than one answer applies, please order them by assigning numbers (1=most important reason, etc.)

	mark the answer(s)	order the answers
favourite colours		
logical associations (e.g. parks green, etc.)		
subjective associations		
artistic vision		
I did not use colours for any specific reasons		
other (please name) _____		

¹⁷ What does it show? what is it about?

¹⁸ Ask in case, if the map elements have different scales

f. Did you include the following in your mental map (1)?

map 2	yes	maybe	no	examples/comments	visualisation (G-T-C-O) ¹⁹
landmark(s)					
my favourite place(s) ²⁰					
important place(s) for me ²¹					
associations					
emotions					
other _____					

3 Similarities and differences

a. Can you describe to me the similarities and/or differences between your mental maps (1, 2)?

What do you think mainly influenced your emotions toward and mental maps (1, 2) of Vienna?

Rate the following by giving them numbers from 1 (very influential) to 5 (not influential)

		1	2	3	4	5
b. My prior ' <u>image</u> ' of Vienna has been influenced by	My prior knowledge, associations, and/or impressions of Vienna					
	Virtual 'Vienna city walk' (the use of different media: maps, images, videos, text, and narrated stories)					

¹⁹ G = graphic elements, T = text, C = colour, O = other

²⁰ In case of having such

²¹ In case of having such

		1	2	3	4	5
c. My prior <u>emotions</u> (towards places) have been influenced by	My prior knowledge, associations, and/or impressions of Vienna					
	Virtual 'Vienna city walk' (the use of different media: maps, images, videos, text, and narrated stories)					

		1	2	3	4	5
d. My current ' <u>image</u> ' of Vienna has been influenced by	My experiences while living in Vienna					
	'Vienna city walk' (walk, narrated facts, shared personal experiences/stories)					

		1	2	3	4	5
e. My current <u>emotions</u> (towards places) have been influenced by	My experiences while living in Vienna					
	'Vienna city walk' (walk, narrated facts, shared personal experiences/stories)					

4 Memorability of places

What makes the following landmarks and places²² memorable and favourite for you?

a. My associated landmarks with Vienna are ... (Q2)²³ and they are memorable because

b. My favourite places in Vienna are ... (Q3)²⁴ because

5 Emotions

a. To which places in Vienna do you feel the strongest emotional connection?

What kind of emotional connection?

Why do you associate those emotions with those places?

b. Do you think your emotions played a role in creating your mental maps (1, 2)?

What kind of?

c. If I asked you to draw another mental map now, would it be different?

How different? Why?

Thank you very much for your contribution ^^

²² Here are referred to the landmarks and places which were mentioned by the respondents in the questionnaire (see appendix B.1)

²³ Corresponds to the Q2 What landmarks do you associate with Vienna? (see appendix B.1)

²⁴ Corresponds to the Q3 My favourite places in Vienna are (see appendix B.1)