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COLLABORATIVE LEARNING IN THE DIAGNOSIS OF THE SOUNDSCAPE OF THE HISTORIC CENTER OF MORELIA, MEXICO

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ABSTRACT

The research and diagnosis of the soundscape are recently in the Mexican case, even more so in the context of its Historical Centers. In this panorama, there is a need not only for professionalization, but also for dissemination within the fields of architecture and urbanism. Thus, this article contains the experiences and results that the team of the project for the research of soundscapes in historic centers of Mexico sponsored by the National Council of Humanities, Sciences and Technology (CONAHCYT) at the Autonomous Metropolitan University (UAM) has carried out with students and professors of architecture at the Michoacana University of San Nicolás de Hidalgo (UMSNH). The intention is to bring students closer to the use and importance of the ISO 12913 Standard, in a context where Mexican regulations are not linked to this research framework which is a need for taking care of the sound heritage of the urban landscape. It is important to highlight the use of participatory methodologies, like sound walks and mappings, as well as citizen participation in the diagnosis and spreading process.

Keywords: *Urban soundscape, public space, historic centers, collaborative learning, Mexico.*

INTRODUCTION

This is an educational exercise undertaken by the Autonomous Metropolitan University of Azcapotzalco (UAM-A) with the goal of disseminating the topic of urban soundscapes among architecture and urban planning schools in several Mexican cities with significant historic centers, such as Puebla, Oaxaca, San Luis Potosí, Guanajuato, Querétaro, and Morelia. Five of these historic centers have been declared World Heritage Sites by UNESCO.

This effort is linked to a CONAHCYT-funded project on soundscapes and socio-ecological well-being in Mexico's historic centers.

It has represented a challenge since the topic is not well known in these types of schools or among the general public.

The goal was to design a theoretical and practical workshop that would be engaging and, at the same time, attract those unfamiliar with the topic.

Of all the cities where the workshop has been held, we selected Morelia, in the state of Michoacán, Mexico, where two workshops were offered: one basic and one intermediate. This was due to the strong enthusiasm of the faculty and students at the Universidad Michoacana de San Nicolás de Hidalgo, specifically at the School of Architecture.

This effort is also part of the intention to create an Ibero-American Urban Soundscape Network, which seeks to integrate the largest number of academic institutions, and the Morelia institution has already agreed to collaborate.

We believe that these informational, outreach, and educational initiatives will help the topic spread throughout Mexico, Latin America, and Ibero-America.

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1. THE IBEROAMERICAN SITUATION

One of the important situations related to the soundscape theme of this study is the Ibero-American soundscape. This implies that there is a vision/audience that distinguishes the Anglo-Saxon, Asian, Iberian, and Latin American ones. In other words, the soundscape has traditionally been considered in urban and public spaces as a generic sound environment, but in reality, the urban soundscape is distinguished according to the cultural characteristics of each community. This is the case in Europe, where there are various options, including Spain, Portugal, France, Italy, and the United Kingdom. In another context, Asia, the United States, Mexico, and Latin America.

This leads to different situations, such as urban contexts, sound sources, and, above all, the way in which different populations perceive sound. Perceiving sounds in Norway is not the same as in Spain, or even in Spain or Mexico. Urban soundscapes differ between Latin American and European cities due to cultural characteristics: Latin America displays layered traditional and modern sounds, along with hustle and bustle, while European areas present patterns related to tourism and transportation on the one hand, and quiet spaces on the other.

In Latin American cities, the stratified acoustic environments by various segments imply that traditional sounds coexist with modern urban noise. Thus, local commercial activities, the use of public space, and urban development also influence soundscape characteristics.

Regarding European cities, patterns related to tourism, transportation, the absence of hustle and bustle and leisure noise in general, but not entirely, are proposed, as well as holistic approaches to soundscape assessment.

Thus, the cultural context can influence urban soundscapes, a situation that requires more geographically diverse studies to verify this assertion.

2. THE CASE OF MEXICO

Mexico's population is characterized by significant cultural and biological diversity. Indigenous communities play a crucial role in preserving and generating biodiversity through their traditional plant use practices [1]. The country's rich cultural heritage is evidenced by its food traditions, recognized by UNESCO as Intangible Cultural Heritage [2]. Mexico's ethnic composition includes Afro-descendant populations, adding to its cultural complexity [3]. The country's youth exhibit specific traits in well-being, cultural consumption, and political engagement [4]. Religious diversity is also notable, with changing patterns of religious affiliation in different regions [5]. Indigenous groups in Mexico face the challenge of balancing economic integration with cultural preservation [6]. This diverse cultural landscape significantly influences health outcomes and demographic and social studies that require strategies for their detailed study [2].

3. MORELIA AND ITS HISTORIC CENTER

Morelia is currently the capital of the state of Michoacán in Mexico (Fig. 1). The state of Michoacán is located in the center-west of the country, bordering states such as Colima, Jalisco, Guanajuato, Querétaro, the State of Mexico, and Guerrero. This geographic location generates a multitude of cultural situations due to the proximity of the different communities.

Morelia, located in the north of the state of Michoacán, has an important historical heritage, as it was established as a city of great importance during the Spanish colonial occupation.

The city was originally named Valladolid. The establishment of the city coincided with initial population growth and increased mestizaje processes.

Traditional culture in Morelia, Michoacán, found several patterns of cultural transformation. After the city's historic center received UNESCO World Heritage designation in 1991, conservation efforts increased along with tourism development. Currently, there is a permanent balance between the conservation and urban development of the city.

The historic center of Morelia, declared a World Heritage Site by UNESCO in 1991, has undergone major transformations in recent decades [7]. Once full by informal street vendors, a successful negotiation process led to their relocation, improving the image of the center and the enjoyment of public space [7] [8]. However, the area faces constant challenges, including depopulation and gentrification [9]. Public space has been shaped by social and economic practices, regulations, and municipal interventions [10]. Tourism development has had both positive and negative effects on the built heritage [11]. The historic center, as a public space par excellence, plays a crucial role in the articulation of the city and the preservation of collective memory [12]. Balancing heritage conservation, tourism, and emerging uses of public space remains a complex task for the urban management of Morelia's historic center [10].

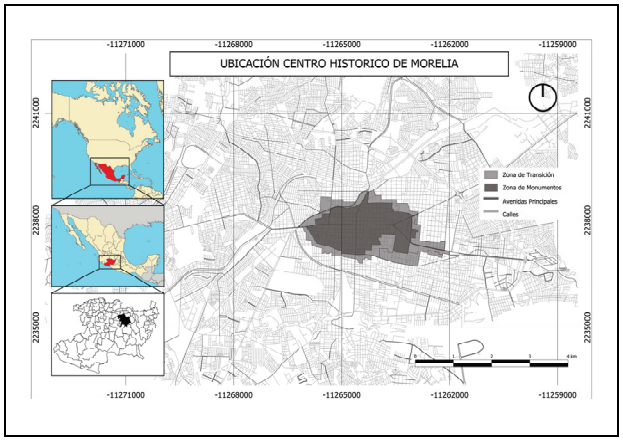

Figure 1. Location of Morelia and its Historic Center in Morelia, Michoacán, Mexico. Adapted from [10].

Morelia's main public spaces (Fig. 2) are plazas, gardens, roadways, walkways, and pedestrian gateways. The map shows:

	Squares		Gardens		Other
A	De Armas	J	San José	D	Calzada
B	M. Ocampo	K	Las Rosas	H	Portal Madero
C	Morelos	L	Las Capuchinas	I	Portal Abasolo
E	Valladolid	M	San Diego	R	B. Cuauhtémoc
F	San Agustín	N	Héroes de 1847		
G	Del Carmen	O	Soterraña		
		P	Villalongín		
		Q	M. Altamirano		

Table 1. List of public spaces in the historic center of Morelia, classified by type of space located on the map in Fig. 2.

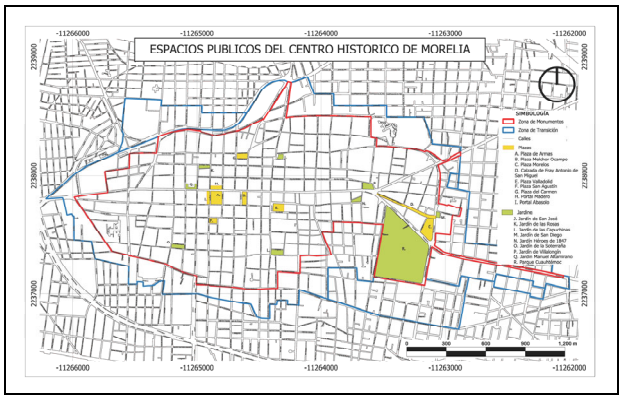

Figure 2. Public spaces in the Historic Center of Morelia, Michoacán, Mexico. Adapted from [10].

Thus, plazas are Morelia's symbolic public spaces, and gardens are public spaces visited by citizens and home to significant trees. The "other" classification refers to special spaces, such as a heavily tree-lined and heavily visited roadway, the downtown portals, and a forest called Bosque Cuauhtémoc, a popular destination for families due to its atmosphere and attractions.

4. THE WORKSHOP AT MORELIA IN MEXICO

In late May and early September 2024, Urban Soundscape and Participatory Cartography Workshops were held in the Historic Center of Morelia. The first was a basic workshop and the second an intermediate workshop. These workshops included theoretical sessions and field visits to various public spaces in the historic center. The basic workshop focused on an introduction to soundscapes with specific field exercises. The intermediate workshop focused on collecting data to apply the ISO 12913 standard [13-15], particularly the second part and a review of the third part.
The workshops were primarily aimed at undergraduate architecture students, with the participation of graduate architecture students, as well as architecture and graduate professors from the Universidad Michoacana de San Nicolás de Hidalgo. The workshop was taught by a team consisting of a professor and undergraduate and graduate students from the Universidad Autónoma Metropolitana Azcapotzalco campus, Mexico City.

4.1 General content of the workshops

The basic workshop consisted of three theoretical sessions [16]and three field visits for data collection.
The theoretical sessions focused on the fundamentals of sound and acoustics, urban planning and public space, as well as urban soundscapes and a review of the ISO 12913 standard (ISO, 2014-2019) and its tools. The final workshop focused on developing the ISO 12913 standard tool, with participants pre-trained in the questionnaire to be answered during the visit to the different spaces.
The basic workshop was attended by 46 participants, including students, faculty, and graduate students.
The intermediate workshop included approximately 30 participants, including students associated with the professors who participated in the workshop with their undergraduate and graduate groups.
The workshop focused on both cases with different levels of difficulty in which participants formed teams of 4 to 6 people where they would use the following tools or mobile phone applications:

1. NoiseCapture[1] for Android for measuring and locating sound levels and spectrograms.
2. Noise Calculator[2] for counting vehicles and obtaining noise levels due to vehicle capacity.
3. ShurePlus Motiv Audio[3], for audio recording at selected points.
4. ShurePlus Motiv Video[4], for taking video aspects around selected points.
5. Google Maps[5] for the coordinate location of the selected point. (GPS)
6. Google Forms[6] for the application of questionnaires based on the ISO 12913-2:2018 standard.

Using these applications, measurements and recordings were taken, and surveys were administered to the population.
During the intermediate workshop, teams of 4 to 5 people were formed, and designated locations were set up where the team members completed the survey, took measurements, and recorded the data.
This provided important data for creating infographics with the core group and assessing the perception of public spaces in the Historic Center. They were also able to observe how to analyze this data with the intermediate group.

[1] **NoiseCapture [17]** is a free and open-source Android application that allows users to measure and share the noise environment. Each noise measure is combined with its GPS track so that the result can be displayed in an interactive map within the application, and in a general Noise Planet Map. at https://noise-planet.org/map_noisecapture

[2] **Noise Calculator**. Educational application on acoustics developed by the AcusticaUACH group. A vehicle traffic noise calculator that allows you to calculate the equivalent noise level based on simple input data: vehicle flow, distance from the center of the street, average traffic speed, and type of street surface.

[3] Shure **The ShurePlus MOTIV** mobile recording app allows you to record, monitor, and control MOTIV digital microphones and Shure recording solutions. It includes metering, equalization, compression, wind noise reduction, an improved user interface, and a new editor.

[4] **MOTIV™ Video** MOTIV Video is a free companion app for iOS and Android and IOS. Whether you're capturing a performance, filming your podcast, or livestreaming on social media, MOTIV Video lets you fine-tune your sound and capture professional audio and video right on your phone.

[5] **Google Maps**. It's a tool for finding directions, GPS, exploring nearby places, and even checking traffic conditions.

[6] **Google Forms** App to create forms and surveys to gather data and gain insights from anywhere.

4.2 WORKSHOP OUTCOMES

After the visits at both the basic and intermediate levels, and after processing the information corresponding to each level. The basic level presented infographics per team. In Figure 1 is the typical infographic information done by the different groups according to the public space evaluated where the participants put photographs, maps, screenshots of acoustic measurements and QR patterns to see and hear some videos of the area of study.
At the top it can be seen the graph that relates to section A.3 "Determination of two soundscape dimensions based on perceived affective quality responses" (ISO 12913-3). Where the evaluation received by this public space is graphed.
These infographics can be displayed in places where the public can observe and become aware of the sounds of their neighborhood or city. It is a magnificent tool for disseminating the subject (Fig. 3).
Additionally, one of the pieces of evidence found for both the basic group and the intermediate group was that the routes and measurements taken with the NoiseCapture app were recorded on the Noise Planet map. (Fig. 4).
With the intermediate group a deeper analysis of public space was carried out, where the results were according to the analysis of Questionnaire part 2: Perceived affective quality, in order to have a deeper view of the perception of each place.
This stage consisted of the teams, once they were informed about the procedure to follow, positioning themselves at various points in the selected public spaces and completing the evaluation form themselves. There were cases where the population was approached using the same procedure, especially in spaces with large crowds.
In this case the public spaces selection was (The letters refer to the locations on the map (Fig. 2):

A Plaza de Armas
B Plaza Melchor Ocampo
D Calzada Fray Antonio de San Miguel
F Plaza San Agustín
G Plaza del Carmen
J Jardín de San José
K Jardín de las Rosas
L Jardín de Capuchinas
M Jardín de San Diego - Jardín Azteca
N Jardín Héroes de 1847
R Bosque Cuauhtémoc

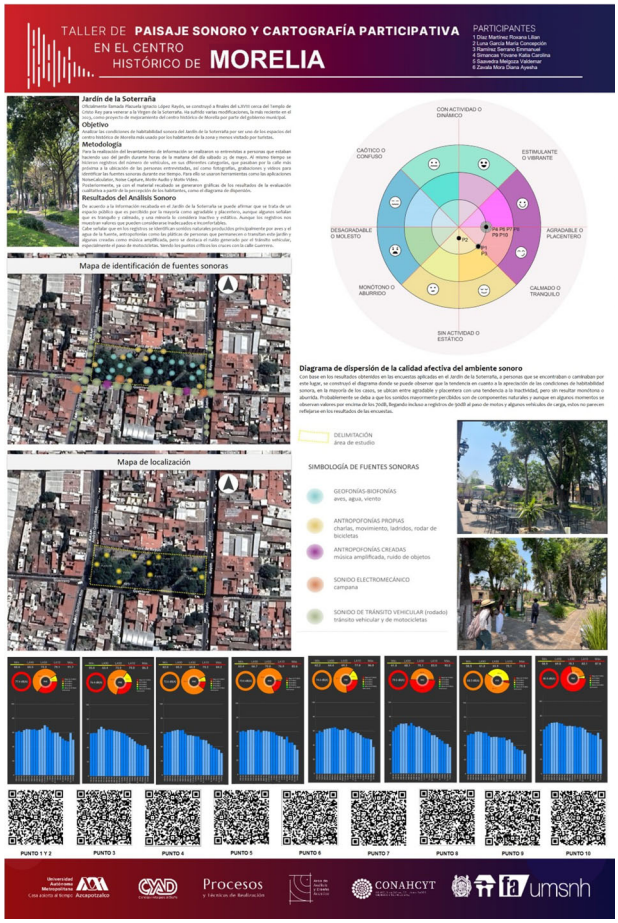

Figure 3. Infographic information about de Soterraña Garden, letter O in public spaces plan, done by a group of six participants between students and teachers [14].

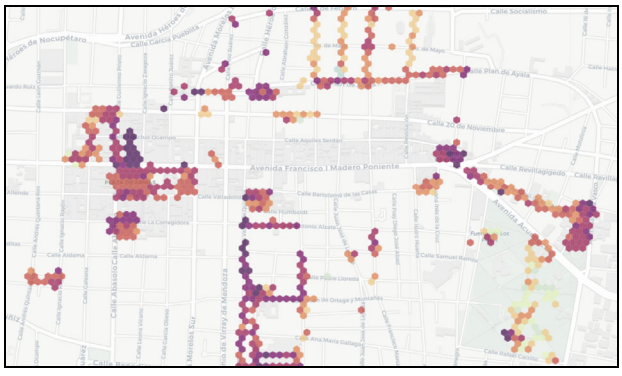

Figure 4. Evidence of the routes and measurements taken in the historic center of Morelia, using the NoiseCapture app. (Noise Planet, 2025) [15].

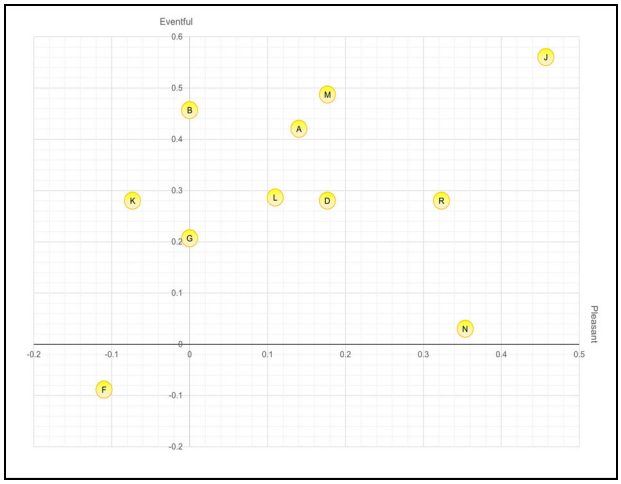

Figure 5. This chart places each public space in terms of eventful-uneventful and pleasant-unpleasant.

The results of the surveys conducted by the intermediate group focused on Q2, which measures Perceived Affective Quality. The results were processed, yielding the following graphs. (Fig. 5, 6, 7 and 8). Fig. 5 shows the whole evaluation for each public space analyzed.
This figure (Fig. 6) shows for every square type of public space the perceived affective quality result of the intermediate group field practice.

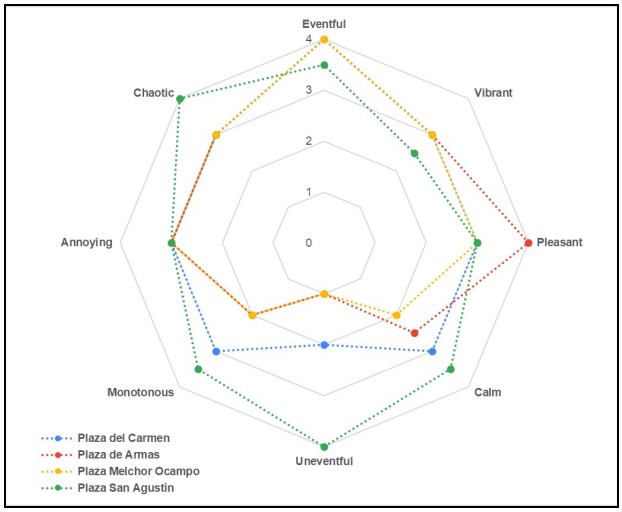

Figure 6. The perceived affective quality of each of the square types of public spaces in Morelia.

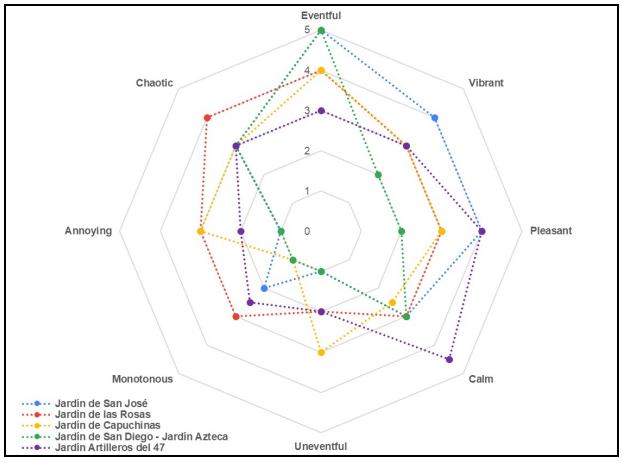

Figure 7. The perceived affective quality of each of the public garden types of public spaces in Morelia.

This figure (Figure 7) shows for every public garden type of public space the perceived affective quality result of the intermediate group field practice.

The figure (Figure 8) shows for every special type of public space the perceived affective quality result of the intermediate group field practice.

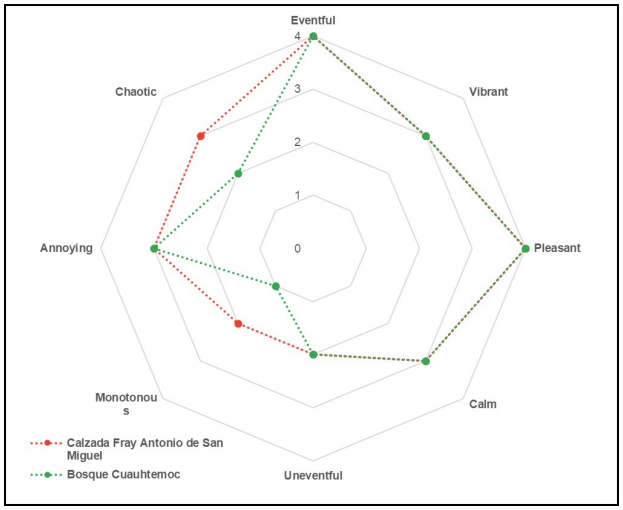

Figure 8. The perceived affective quality of each of the special types of public spaces in Morelia, the Calzada and the Cuauhtémoc Forest.

5. Discussion

Conducting these workshops in different cities in Mexico has provided many lessons. One aspect that stood out is the surprise experienced by most participants, who were unaware of the impact of noise on the city. By completing the practical exercises, many of them became more aware of this.

The practical exercises were carried out using mobile phone applications, which helped them connect with the exercises, facilitating their execution and obtaining results, and ensuring that they retained the data and recordings obtained. It was, in a sense, a citizen science workshop that left a profound impact on them.

From the first time this workshop was held in 2023 in the city of Puebla de los Ángeles, it was clear that the express mission was to scientifically disseminate the topic of Soundscape and encourage practices that would clarify the concept.

Basic workshops were held in each of the cities, but it was in Morelia, thanks to the enthusiasm of teachers and researchers, where this intention was most realized.

The two workshops held in Morelia, in conjunction with the UAM-A and the UMSNH, created a bond that encouraged teachers to practice this topic within their courses. This is highly commendable, and thanks to this, it is the city where the most progress has been made in this regard. The lectures and practices that were held were very well received by people who had never heard of the term Soundscape and generated great enthusiasm.

In Mexico, this dissemination is an urgent task, as the concept of sound as an element that can generate health and well-being is not considered. The only way to achieve this is through a campaign like the one we are carrying out, so that young people and their teachers understand its importance and thus continue to evolve.

Given the results obtained from these workshops and the enthusiasm shown by both teachers and students, this initiative is now worth expanding as widely as possible to universities and educational centers in Mexico and Latin America.

Thus, the workshops held in Morelia demonstrate the potential for this topic, which is so important for people's health, well-being, and enjoyment, to be addressed through the formation of groups such as networks.

One important aspect would be to include these topics in university curricula. This will surely attract many young people to become involved with the subject and even apply it in their design work.

This has been done at the Metropolitan Autonomous University's Azcapotzalco campus within the architecture program, and it has been a complete success.

6. CONCLUSIONS

Two workshops with varying levels of difficulty were taught by the Acoustic Analysis and Design Laboratory and students from the undergraduate program in architecture and the graduate program in urban studies at the Autonomous Metropolitan University (Universidad Autónoma Metropolitana Azcapotzalco Campus) on the urban soundscape in the historic center of Morelia, Mexico.
The workshops aimed to disseminate the topic of soundscape among students and faculty from the undergraduate program in architecture and the graduate program in architecture at the Universidad Michoacana de San Nicolás de Hidalgo. Theoretical sessions and fieldwork sessions were conducted using mobile applications.
The workshops were basic and intermediate. The first aimed to introduce the topic and obtain data for creating infographics of the different public spaces analyzed. The intermediate workshop focused primarily on Parts 1, 2, and 3 of ISO 12913 standard.
The results demonstrated that participants understood the exercises, even though they had no prior knowledge. This demonstrated, on the one hand, the viability of the workshops and the possibilities that arise when they are offered in educational institutions.

7. ACKNOWLEDGMENTS

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