

Dear Reviewer #4

We appreciate the time and effort of the reviewer in reviewing our paper and we have improved the manuscript based on reviewers' suggestions and comments. These responses are elaborated in the point-by-point responses to your comments below.

Specific comments:

[Section 1] must be improved.

- 1. Authors should emphasize contribution and novelty. The introduction needs to clarify the motivation, challenges, contribution, objectives, and significance/implication.**

It is important to note that this article primarily aims to offer a pedagogical reflective review of the soundscape design studio, focusing on soundscape education, rather than presenting scientific research findings. The article has been submitted to the special issue on "Designing Sustainable Urban Soundscape," specifically under the topic of *Education in Soundscape*. The main objective of this paper aligns well with the theme and topic of the special issue.

In the introduction section, we have reviewed papers on soundscape design education programs [11–13] (**Lines 47-72**). The previous studies have mainly emphasized the integration of soundscape approaches such as data collection methods, acoustic measurement, and simulations into the design process. However, they have been limited in their consideration of how to incorporate social and behavioral contexts into soundscape design. To address the limitations of soundscape design education, the integration of the social architecture approach into soundscape design education could be valuable as it enable to analyze the social and behavioral aspects of specific locations that shape the soundscapes.

Thus, this paper focuses on a a review of an architectural design studio that adopted both social architecture and soundscape approaches to design urban public spaces. Furthermore, the aim of this paper is to not only provide a reflective review of the design process and outcomes of the design studio but also to identify limitations and challenges that could provide valuable information for educators who teach soundscape design in undergraduate architectural education. To enhance clarity, we have revised the introduction section to include a clear articulation of the novelty, significance, and implication of ths article in the revised manuscript.

- 2. You must properly introduce your work, specify well what were the goals you set yourself and how you approached the problem.**

Thank you for your suggestion. As the reviewer suggested, the objective and approach of this study are clearly described as follows:

Lines 84-94: “In this sense, by incorporating the social architecture approach into soundscape design education, students can gain a better understanding of the social and behavioral aspects of the acoustic environment and develop more inclusive and enjoyable public spaces. This paper focuses on a reflective review of an architectural design studio that adopted both social architecture and soundscape approaches to design urban public spaces. The design studio was conducted for third-year undergraduate students of the Architecture and Sustainable Design (ASD) Pillar at the Singapore University of Technology and Design (SUTD). The aim of this paper is to not only provide a reflective review of the design process and outcomes of the design studio but also to identify limitations and challenges that could provide valuable information for educators who teach soundscape design in undergraduate architectural education.”

3. What are the advantages of the proposed work in comparison to already existing ones? This must be clear in the text. Please compare the proposed work with other existing ones.

As the reviewer suggested, we have conducted a review of previous studies on soundscape design education programs [11–13] and addressed the limitations of existing studies in the introduction section as follow:

Lines 47-72: “To address this gap, several attempts have been made to incorporate the soundscape approach into design education programs [11–13]. Kandemir and Özçevik Bilen [11] conducted a review of an architectural design studio with a theme of soundscape that was held during the academic year of 2015-2016 at the Department of Architecture at Anadolu University, Turkey. They presented a comprehensive approach to the soundscape design studio that involved various phases such as binaural sound recordings, acoustic analyses, identification of context and issues, and final design outcomes. Winne et al. [12] presented an overview of the 2019 soundscape hackathon event held during the Urban Sound Symposium in Ghent, Belgium, where participants were tasked with designing urban soundscape interventions using virtual reality visualization and auralization technologies and presenting their solutions to a professional jury. In their paper, they analyzed the process, results, benefits, and shortcomings of the hackathon. Xiao et al. [13] used a reflective practice approach to compare the educational process of sound engineering and architectural design students across four projects conducted in different UK higher education institutions between 2015 and 2020. They examined how the soundscape approach such as soundwalks, acoustic measurements, and computational simulations can be integrated into teaching building acoustics and design studios, while also discussing potential future directions for soundscape design education.

The previous studies on soundscape design education have largely emphasized the integration of soundscape approaches such as data collection methods, acoustic measurement, and simulations into the design process, but have been limited in their consideration of how to incorporate social and behavioral aspects into soundscape design. Soundscapes are not only about the physical characteristics of sound but also

about how those sounds impact individuals and communities in spaces. By considering social and behavioral contexts, designers can create soundscapes that are tailored to the specific needs and preferences of the people who reside or use a particular space.”

[Section 2] must be improved. In this section, you present your methodology.

4. You should explain all the steps in detail.

Thank you for your comment. As the reviewer suggested, detailed descriptions of the behavioral observations, acoustic measurements, and soundwalks, have been included in the revised manuscript in Section 2.3. **(Lines 194-254)**

5. You first mentioned a measures and then said you used them.

As answered in Q1, similar to previous studies on soundscape design studios [11–13], this paper primarily focuses on providing a pedagogical reflective review of the soundscape design studio rather than presenting scientific research findings, which aligns with the theme of the special issue on "Designing Sustainable Urban Soundscape" to which it was submitted.

In line with previous studies on soundscape education [11–13], acoustic measurement data were not reported in this paper due to potential limitations in reliability and accuracy arising from the students' data. Regarding noise measurement, the students used the NoiseCapture smartphone application, which is free and open-source Android software, to measure acoustic environments at the selected sites. By utilizing the built-in microphone of a smartphone, the NoiseCapture provides real-time sound levels and noise indicators (A-weighted equivalent sound levels, spectrum, percentile values). However, the acoustic measurement results were not reported in this paper since the calibration procedure of the students' smartphone microphones was not done accurately.

Smartphone microphones are not always calibrated for precise sound measurements. This lack of calibration may introduce some level of uncertainty or inconsistency in the recorded sound data. In addition, the accuracy of the sound measurements may be influenced by the quality of the smartphone's built-in microphone. The microphone's sensitivity and frequency response may vary across different smartphone models, leading to uncertainties and inconsistencies in the measurement data. Thus, the limitations of the application have been described in the revised manuscript as follows:

Lines 206-216: “The students utilized the NoiseCapture smartphone application [28], an Android application available for free and as open-source software, to measure the acoustic environments at the chosen sites. The application employs the smartphone's built-in microphone to measure real-time sound levels and noise indicators, including A-weighted equivalent sound levels, spectrum, and percentile values. However,

smartphone microphones are not always calibrated for precise sound measurements, resulting in potential uncertainties and inconsistencies in the measurement data. Furthermore, the quality of the built-in microphone can vary among different smartphone models, affecting the accuracy and reliability of the sound measurements. Thus, the acoustic measurement results were not presented in this paper due to concerns regarding the accuracy of the students' smartphone microphone calibration.”

6. You mentioned a survey but did not say how you prepared it.

I apologize for the confusion. To assess the perceived acoustic environment of the sites, we conducted a soundwalk using the questionnaire protocol Method A outlined in ISO/TS 12913-2. This approach, which combines a soundwalk with a questionnaire, is commonly adopted in previous studies. To ensure clarity, we have revised the term "on-site soundscape survey" to "soundwalk" in the revised manuscript as follows:

Lines 217-231: “Meanwhile, a soundwalk, a method involving walking in an area and attentively listening to the acoustic environment, was conducted to assess the perceived acoustic environment of the sites by using the questionnaire protocol Method A outlined in ISO/TS 12913-2. The Method A questionnaire consists of three sections. The first section evaluates the dominance of identified sound source types on a 5-point scale, ranging from "1: do not hear at all" to "5: dominates completely". The sound sources are categorized into six groups, including traffic noise, sounds from humans, water sounds, bird sounds, wind sounds, and ventilation noises. An open-ended option is also provided to capture other sounds of interest to the participant. The second section assesses the perceived affective quality of the soundscape using eight adjective attributes (pleasant, annoying, vibrant, monotonous, calm, chaotic, eventful, and uneventful) on a 5-point scale, ranging from "1: Strongly disagree" to "5: Strongly agree". The adjective attributes include pleasant, chaotic, vibrant, uneventful, calm, annoying, eventful, and monotonous. The third section evaluates the overall soundscape quality on a 5-point scale, ranging from "1: Very bad" to "5: Very good".”

7. You have not described in detail how the survey was administered.

As the reviewer suggested, we have described how the soundwalk conducted in the revised manuscript as follows:

Lines 234-239: “Throughout the fieldwork, the students were divided into four groups, each consisting of three or four students, and each group was assigned a specific target site among the four public sites. During the soundwalks, each group of students selected evaluation locations within the assigned public space where they experienced distinct acoustic environments.”

8. You have not described the sample of people who received it.

Thank you for the suggestion. In compliance with social distancing protocols implemented during the COVID-19 pandemic, only the students in the design studio participated in the soundwalks. Description of the participants in the soundwalks has been added in the revised manuscript as follows:

Lines 239-241: “It is important to note that, due to social distancing measures during the COVID-19 pandemic, only the students in the design studio participated in the soundwalks.”

9. You did not say whether the subjects had an audiometric test done.

As the soundwalk was not designed as a listening test, formal audiometric tests were not conducted to assess participants' hearing. However, it should be noted that all the students participating in the soundwalk were in their 20s and self-reported having normal hearing.

10. Where the tests were performed.

As mentioned in previous questions, the soundwalks were carried out on actual sites not in a controlled laboratory environment.

11. The part explaining that the students have taken a course is superfluous.

As per the reviewer's comment, the unnecessary part describing the students taking the course in Section 2.1 has been removed in the revised manuscript.

12. Instead it is necessary to describe in detail how the analysis was conducted.

As the reviewer suggested, a detailed description of the fieldwork procedures, encompassing behavioral observations, acoustic measurements, and soundwalks, has been included in the revised manuscript in Section 2.3. **(Lines 194-254)**

13. (Line 113) balanced proximity is the key for all safety design project, but this is not a reason for creating a new form of urban conviviality

We agree that balanced proximity is not a proper reason for creating a new form of urban conviviality. For ensure clarity, the sentence has been revised as follows:

Lines 131-132: “Could we engage a sense of sounds to help create a new form of urban conviviality?”

**14. Add references to works that have already dealt with the topic, for example:”
Representation of the soundscape quality in urban areas through colours”**

Thank you for suggesting the reference. We have added the reference in the revised manuscript as follows:

Lines 231-233: “Based on the collected soundscape data, the students analyzed the soundscape characteristics of the sites using various visual representations, including sound source maps and soundscape quality maps [29,30].”

15. (line 115) Do not use abbreviation such as i.e. I have seen that you often use this abbreviation, so I will not repeat this advice again, it also applies to the other occurrences.

As per the reviewer’s suggestion, we have removed the abbreviation “i.e.” in the revised manuscript.

16. (Lines 134-181) Explain detailed the reason that you choose these locations.

As the reviewer suggested, the reason for selecting Marina Central Business Improvement District as the project site has been described in the revised manuscript as follows:

Lines 137-145: “Marina Central Business Improvement District (BID), which is close to the waterfront of Marina Bay, was selected as the project site due to its unique characteristics and significance in the urban context. Marina Central BID is known for its diverse mix of commercial, residential, and recreational spaces, attracting a large number of visitors and residents. The dynamic nature of the district and its central location make it an ideal setting to study and propose innovative design solutions for enhancing the urban soundscape.

Figure 1 shows four public spaces (South Beach, Suntec City, Marina Square, and Millenia Walk) identified by the Urban Redevelopment Authority (URA)’s Marina Central BID program for enhancing the vibrancy of the precinct where business meets leisure.”

17. (Lines 212-214) How did the authors characterize sounds without measures? This aspect must be adequately addressed. Otherwise the paper loses its scientific value.

As answered in Q1 and Q5, this paper focuses on providing a pedagogical reflective review of the soundscape design studio rather than presenting scientific research findings. Previous studies on soundscape design studios [11–13] also have reviewed the soundscape design outcomes without reporting acoustic measurement and simulation results.

[Section 3] must be improved.

18. Figures must be improved: The text is too small and appears blurry, making it difficult for the reader to follow the flow of information.

Thank you for the feedback. In response to the reviewer's comment, we have replaced the images with high-resolution versions in the revised manuscript.

19. Make Figure and Caption fit on the same page.

As per the reviewer's suggestion, we have edited to ensure that all figures and their captions fit on the same page in the revised manuscript.

20. A description of the hardware and software used for data processing is completely missing. Describe in detail the hardware used: Extract this data from the datasheet of the hardware manufacturer. To make reading the specifications of the hardware more immediate, you can insert them in a table, listing the instruments used and the specific characteristics for each.

In response to the reviewer's comment, we have included a description of the hardware utilized for the acoustic measurements in the revised manuscript as follows:

Lines 206-216: “The students utilized the NoiseCapture smartphone application [28], an Android application available for free and as open-source software, to measure the acoustic environments at the chosen sites. The application employs the smartphone's built-in microphone to measure real-time sound levels and noise indicators, including A-weighted equivalent sound levels, spectrum, and percentile values. However, smartphone microphones are not always calibrated for precise sound measurements, resulting in potential uncertainties and inconsistencies in the measurement data. Furthermore, the quality of the built-in microphone can vary among different smartphone models, affecting the accuracy and reliability of the sound measurements. Thus, the acoustic measurement results were not presented in this paper due to concerns regarding the accuracy of the students' smartphone microphone calibration.”

21. Also, you should describe in detail the software platform you used. Also describe the machine learning-based libraries you used.

In response to the reviewer's comment, we have included a description of the software utilized for acoustic simulation in the revised manuscript as follows:

Lines 246-254: “Particularly, a workshop was conducted to teach students to use the Pachyderm acoustic simulation software [31], an open-source acoustic simulation plug-in for Rhinoceros 3D (Robert McNeel & Associates). The simulation software was primarily utilized as an educational tool to facilitate communication and articulation of design concepts and processes rather than presenting research findings. It should be noted that the simulation results cannot be considered as reliable research findings since not all students had prior experience or training in architectural acoustics before participating in the design studio. Therefore, the simulation results were not included in this paper.”

In addition, the students did not used any machine-learning library for their projects.

- 22. I could not find a detailed description of the evaluation metrics you have adopted. How will you measure your work's performance? This section is essential in order to demonstrate the effectiveness of your methodology. Furthermore, only by adopting adequate metrics will it be possible to compare your results with those obtained by other researchers.**

The students used the NoiseCapture smartphone application, a free and open-source Android software, to measure acoustic environments at the selected sites. By utilizing the built-in microphone of a smartphone, the NoiseCapture provides real-time sound levels and noise indicators (A-weighted equivalent sound levels, spectrum, percentile values). However, the acoustic measurement results were not reported in this paper since the calibration procedure of the students' smartphone microphones was not done accurately. Thus, the limitations of the acoustic measurement have been described in the revised manuscript as follows:

Lines 206-216: “The students utilized the NoiseCapture smartphone application [28], an Android application available for free and as open-source software, to measure the acoustic environments at the chosen sites. The application employs the smartphone's built-in microphone to measure real-time sound levels and noise indicators, including A-weighted equivalent sound levels, spectrum, and percentile values. However, smartphone microphones are not always calibrated for precise sound measurements, resulting in potential uncertainties and inconsistencies in the measurement data. Furthermore, the quality of the built-in microphone can vary among different smartphone models, affecting the accuracy and reliability of the sound measurements. Thus, the acoustic measurement results were not presented in this paper due to concerns regarding the accuracy of the students' smartphone microphone calibration.”

[Section 5] must be improved.

- 23. Paragraphs are missing where the possible practical applications of the results of this study are reported. What these results can serve the people, it is necessary to insert possible uses of this study that justify their publication.**

For practical applications in soundscape design, we have reviewed and discussed the soundscape design strategies applied in the students' design proposals at four urban sites with three categories: 1) Introduction of wanted sounds, 2) Reinforcement of wanted sounds, and 3) Reduction of unwanted sounds in Section 4.2.

24. They also lack the possible future goals of this work. Do the authors plan to continue their research on this topic?

This paper aims to offer a pedagogical reflective review of the soundscape design studio, focusing on soundscape education, not reporting scientific research findings. Thus, limitations and potential future directions in soundscape design education have been discussed in Section 5 as follows:

Lines 711-728: “Nevertheless, there are still limitations and challenges in teaching soundscape design. Soundscape design requires technical knowledge of urban and architectural acoustics. In this course, lectures on basic theories of soundscape and urban acoustics were provided to the students in the first few weeks, but it might not be insufficient for the students to fully understand the results of acoustic measurement and simulations. Therefore, it is crucial to provide education and training focused on architectural acoustics and simulations to equip students with the necessary skills to create practical and effective design proposals. Furthermore, the majority of students used the Pachyderm acoustical simulation software to evaluate their acoustic design solutions. However, it is important to note that the software is designed for simulating room acoustics and may not be as effective when applied to urban acoustic simulations. Thus, future soundscape design studios should provide training sessions for easy-to-use urban sound propagation simulation tools to enhance students' understanding and application of the principles of soundscape design. Lastly, since the soundscape design approach emphasizes the perceived qualities of the acoustic environment and the context of places, soundscape design education should also incorporate auralization tools that leverage virtual reality techniques to provide students with a more immersive and realistic experience when designing soundscapes in the future.”

We thank you again for your supportive review and for making the effort to help us improve our manuscript.

Sincerely,

The Authors