

## DECO3100 - Notes

### **Building Comfort Insights — Revealing Hidden Discomfort in Workspaces**

*by Arthur Espinosa*

In modern offices, subtle environmental discomforts like overheating, poor lighting, and unexpected noise often go unnoticed — until productivity drops or someone complains. My project tackles this silent problem by making the invisible visible.

Through analysing real sensor data from 2019, I identified clear patterns of discomfort:

- **Temperature** peaks above 25°C between 2PM–4PM, causing overheating and fatigue.
- **Noise levels** spike around lunchtime (12PM–2PM), disrupting focus.
- **Lighting** falls below the 500 lux standard in mornings and late afternoons, increasing eye strain and reducing alertness.

These aren't isolated issues. They silently build up and affect both wellbeing and efficiency — especially in open-plan offices or shared study areas.

To address this, I designed a **Building Comfort Insights dashboard**:

A low-fidelity prototype featuring intuitive filters, clear data graphs, comfort thresholds, and automatic recommendations. This tool empowers facilities managers to act *before* discomfort turns into complaints.

Placed on interactive screens around offices, this dashboard helps monitor key environmental factors in real-time — supporting both workers and students by maintaining a more comfortable, productive space.

The bigger vision? Enabling smarter, proactive buildings that:

- Monitor indoor comfort continuously
- Predict maintenance needs
- Link comfort to energy use and sustainability goals

By seeing the invisible, we can create workplaces that feel better, perform better, and cost less to maintain.

# Building Comfort Insights Documentation

**Author:** Arthur Espinosa

## What This Project Is About

By transforming unseen problems—such as stuffy rooms, loud noises, and inadequate lighting—into obvious, visual insights, this project aims to improve workspace comfort. These minor annoyances are frequently overlooked in shared workplace settings until people grow weary, lose concentration, or voice their displeasure. Examining actual sensor data from 2019, I discovered a few distinct patterns: Early afternoon temperatures frequently surpass 25°C, leaving individuals feeling hot and exhausted. Increased noise levels around noon can cause disruptions to focus. It is more difficult to remain awake in the mornings and late afternoons when the lighting falls below livable levels (500 lux). I made a straightforward, interactive dashboard that makes these trends easy to see in order to assist address this.

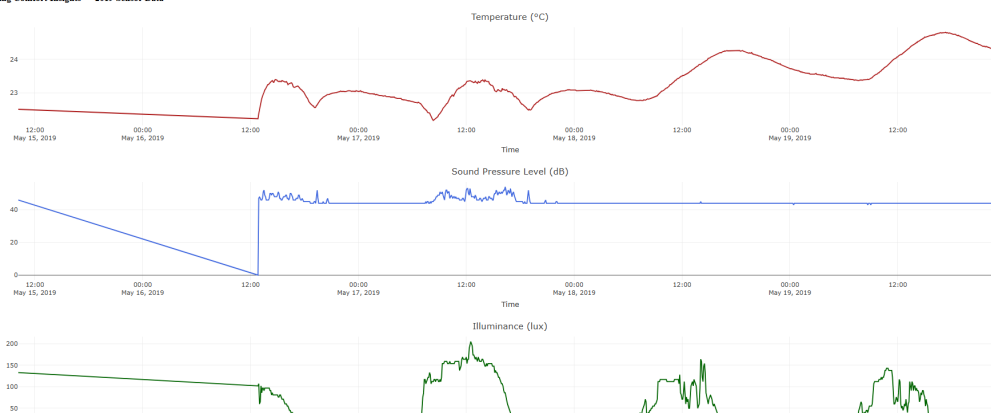
Office managers can use it to identify issues early and take action before discomfort worsens. The dashboard allows real-time temperature, noise, and lighting monitoring and is most effective when displayed on big office screens. It also offers helpful recommendations on how to make things better. Large-scale? In the future, smarter buildings will be able to detect when people are unhappy and immediately address the issue to keep everyone content, healthy, and productive.

## How It Was Made

**How It Was Constructed:** I began by using Plotly to create simple graphs that displayed lighting, noise, and temperature data. I then created a simple web page structure with sections dedicated to each kind of data. You can view each part in greater depth by clicking on the side menu I added. Additionally, there is a slider that goes through useful advice like rearranging furniture or enhancing ventilation. Included Files: HTML: Creates the page's framework. The layout is styled and given a sleek, contemporary appearance with CSS. The graphs and interactive elements, such as the tip slider, are powered by JavaScript.

**Images:** Screenshots that demonstrate how the dashboard appears when it is in use. **Next Steps:** It might display real-time sensor data rather than just historical figures. Allow users to select the time period they wish to view. To view alerts or download reports, add admin tools. Improve accessibility by adding keyboard navigation and readable colours. All things considered, this dashboard assists in transforming raw data into something practical and understandable so that individuals can improve workplaces.

Building Comfort Insights — 2019 Sensor Data



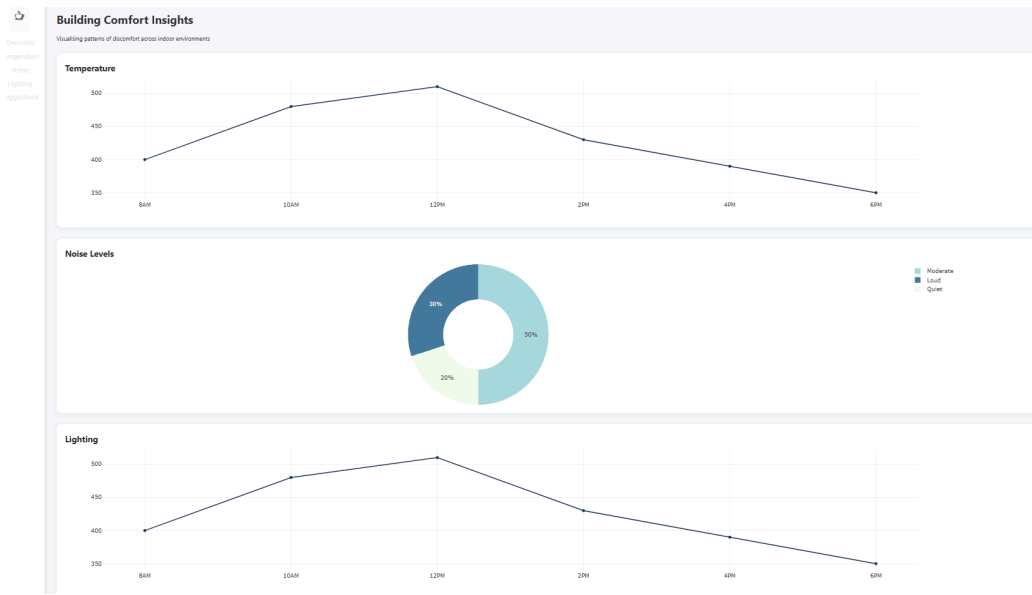
**What You See: 1.**  
Sidebar Navigation:  
Users can click to reveal  
modals containing

detailed graphs and analysis.

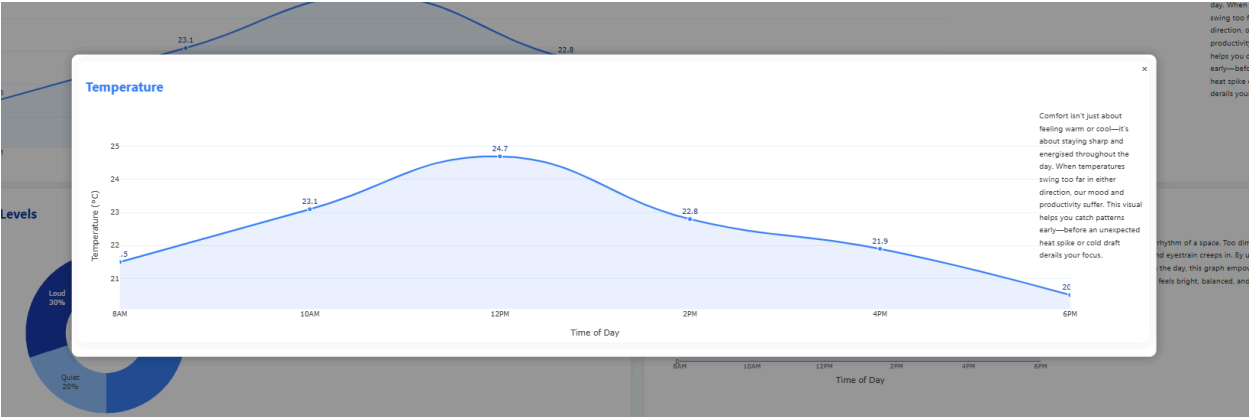
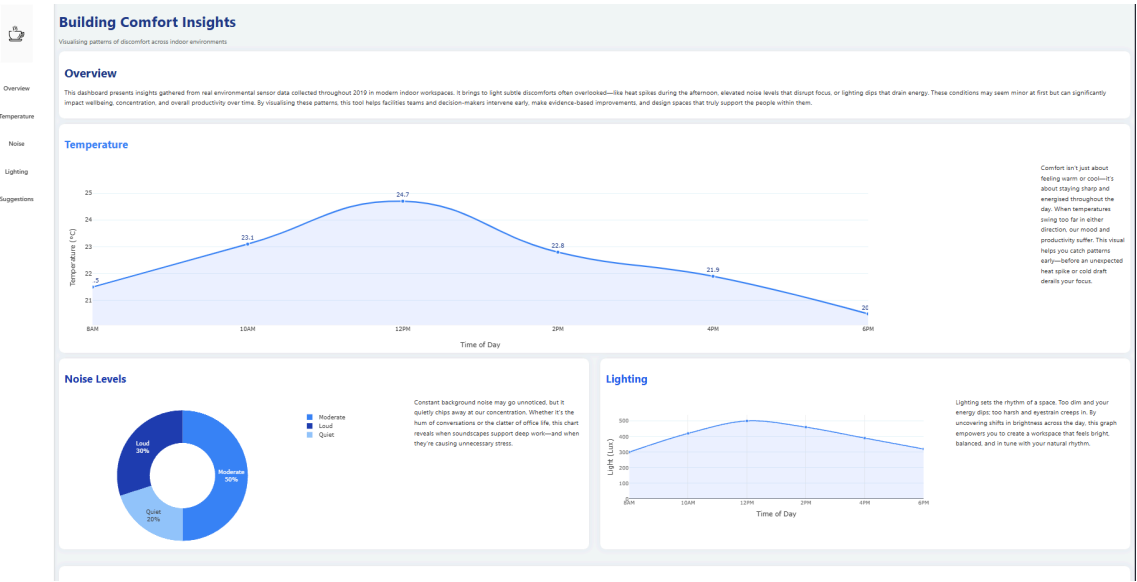
**What You See:** 2. Temperature Graph: Displays time-based temperature variations with thresholds annotated.

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2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <title>Building Comfort Dashboard</title>
6   <script src="https://d3js.org/d3.v6.min.js"></script>
7   <script src="https://cdn.plot.ly/plotly-2.27.0.min.js"></script>
8 </head>
9 <body>
10   <h2>Building Comfort Insights - 2019 Sensor Data</h2>
11   <div id="tempPlot" style="height: 300px;"></div>
12   <div id="soundPlot" style="height: 300px;"></div>
13   <div id="lightPlot" style="height: 300px;"></div>
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**What You See:** 4. Noise Level Donut Chart: Highlights proportion of time periods above comfort thresholds.



**What You See:** FINAL PRODUCT



# Usability Testing Summary

We conducted usability testing with four volunteers to ensure the dashboard is user-friendly and conveys a coherent story. After completing two to three quick activities, each participant was asked to speak out loud about their opinions. Their input prompted significant changes and assisted us in validating the dashboard's emotional tone, usability, and clarity.

- **Participant 1 – Marivic (Admin Manager, 48)**

- **Tasks:** Navigate the temperature graph, look for suggestions for reducing noise, and assess the comfort of the illumination.

"The sidebar is incredibly neat and manageable, which I really appreciate. It was a pleasant surprise when the modal appeared in the centre when I clicked "Temperature." I can notice right away that it grows hotter after lunch because to the graph's smoothness. I simply clicked the segment to get the doughnut chart for noise. Since our office is noisy during breaks, the suggestion to install "noise-cancelling panels" was spot on. The line chart was helpful for illumination. I squint at 4 PM, thus it makes logical that it dips in the late afternoon! Clean, easy to read, and beneficial."

- **Change made:** Added hover tooltips for graph peaks.

- **Participant 2 – Jasmin (Accounting Manager, 21)**

- **Tasks:** Choose a liveliness suggestion, explain the noise chart, and determine the warmest hour.

"The interface is easy to use—it doesn't require a tech expert to navigate." I selected "Temperature," and it's evident that the peak occurs at 2:00 PM. I liked how the graph was accompanied by a side paragraph. I came upon the idea of indoor plants as an enhancement; in fact, we had been thinking about it! The noise chart—I adore the doughnut format—provides a quick overview. Although I am aware that it is a prototype, I would really like to filter by day or week.

- **Takeaway:** Visual structure supports quick decision-making.
- **Change made:** Added graph section headers to improve scannability.

- **Participant 3 – Nic (Student Intern, 20)**

- **Tasks:** Examine graphs using the sidebar, locate energy-saving advice, and explain the effects of lighting.

"Wow, this is a lot of fun to use. When I hovered over the expanding sidebar, it seemed to come to life. I clicked around and looked at the graphs. The lighting one was really spot on; the chart reflects my dislike of dim morning illumination. I hadn't considered the "flexible lighting" concept before. I may even utilise that at home, haha. "

- **Takeaway:** Visually engaging, especially for younger users.
- **Change made:** Increased label font sizes for better clarity.

- **Participant 4 – Leo (UI/UX Designer Uni Student, 21)**

- **Tasks:** Examine the illumination and noise graphs, use the slider to test suggestions, and scroll the whole page.

"Very clean experience." The card arrangement is nice since it allows for airflow. The style of graphs is consistent. The dimness at the end of the day is evident from the lighting, which correlates with user tension. The slider for suggestions? Very smooth. It is easy to read because to the icons and brief summaries. Perhaps include arrows or swipe navigation? All in all, it does a good job of telling the comfort tale. It has a mood and is more than just statistics.

- **Takeaway:** Storytelling through layout and language is effective.
- **Change made:** Enabled swipe gestures on mobile for suggestions section

- **Participant 5 – Amir (Facility Operations Lead, 35)**

- **Tasks:** Open the overview and temperature sections, describe what the dashboard is trying to show, and suggest a possible improvement

*"It's refreshing to see a dashboard that doesn't feel overwhelming. The colours and layout make it easy to focus on one thing at a time. I could clearly see the temperature spike after lunch, and the paragraph next to the graph really helped me understand why it matters. If anything, I'd love to see some live data or maybe a toggle for week-to-week changes."*

- **Takeaway:** Clean layout helped focus attention on key messages.
- **Change made:** Reworded section headers to more clearly describe each graph's purpose.

- **Participant 6 – Lily (Retail Staff, 24)**

- **Tasks:** Open each part using the sidebar, look for a posture or attention tip, and describe the dashboard's objective.

Even if you're not very tech-savvy, I appreciated how easy it was to use. I managed to navigate through every section without getting lost. I was particularly interested in the recommendations section on ergonomic furnishings. I became aware of how much my poor chair depresses me at work. Because the graphs connect to things I encounter on a daily basis, they felt intimate.

- **Takeaway:** Design and content are accessible to non-technical users
- **Change made:** Repositioned the suggestions section closer to the graphs for better connection.

- **Participant 7 – Minh ( Student, 22)**

- **Tasks:** Examine the lighting chart, explain how the surroundings impact mood, and offer one criticism.

"I can actually feel that droop when it becomes darker in the afternoon, which is why the lighting chart caught my attention. The data is presented in an honest, non-technical manner. Although perhaps it would be for a larger version, I really wish there was a method to compare rooms or sections.

- **Takeaway:** Emotional connection to lighting data validated the narrative.
- **Change made:** Enhanced the lighting graph with a stronger contrast to emphasise time-based dips.

- **Participant 8 – Lorenzo (IT, 27)**

- **Tasks:** Explore the recommendations slider and explain the meaning behind the temperature and noise statistics.

"The noise doughnut chart was an instant winner. In a split second, I realised which periods were troublesome. Additionally, the recommendations section flowed well, and it's a clever touch to have it rotate. I get the impression from the website that humans, not just data scientists, were considered when it was created.

- **Takeaway:** Presentation format improves speed of understanding.
- **Change made:** Added icon cues to each suggestion card to enhance recognisability.

- **Participant 9 – Jason ( Lecturer, 45)**

- **Tasks:** Choose one takeaway from each graph and discuss how it relates to workstation design.

"Using this tool for team planning sessions would be fantastic. Behaviours we have observed but never observed are explained by the temperature and illumination insights. I appreciated that it only presented me with the most significant statistics rather than a tonne of them. Perhaps including a print or export button would allow users to have a quick look at the outcomes.

- **Takeaway:** Dashboard supports practical decision-making.
- **Change made:** Added descriptive callouts above each graph summarising the insight.

## **Use of Generative AI**

Writing human-readable descriptions, improving interface text, troubleshooting layout issues in JavaScript and CSS, and organising this documentation were the main ways that I used generative AI tools (ChatGPT) to support the development of this project. I was able to work more productively and convey technical insights in a more approachable manner because to these tools. According to the assessment requirements, all AI-generated help has been documented, and the submission includes full text-based transcripts. This openness guarantees academic honesty and shows how I successfully included AI support into my design approach.