



Adding value to research and technology through integration of artists in projects and synergy creation between creative industries, entrepreneurs, researchers and arts

STARTS Residency Public Report

Residency name

Pollution Explorers

Pollution Explorers is a residency led by Ling Tan of Umbrellium with hackAIR

Abstract (The abstract should not exceed 250 words. It should briefly summarize the essence of the paper and address the following points.): **Artwork**: Briefly present the Artwork, including relevant background, in language accessible to a general audience. **Proposed Methods and Procedures**: Methodology used to produce the Artwork. **Co-creation process**: Describe the functional aspects of the residency and the role of each partner, including resources, communication and production means. **Impact**: How the residency impacts both parties. **Art-science relationships**: Place your collaboration in the general framework of art-science relationships. **Future Direction and Actions**: What are the next steps after the STARTS Residency program. Detailed discussion of these aspects should be provided in the main body of the paper.

Index Terms—About five keywords or phrases in alphabetical order, separated by commas

I. INTRODUCTION

STARTS will do the final formatting of your paper. Your paper should target 4 pages but this is not mandatory and it can be as long as 6 pages (approximately 3000 words).

Pollution Explorers is a participatory project in which people make sense of the quality of air in their environment through their innate subjective perception using wearable tools, air quality sensors and hackAIR platform. The aim is to consider how citizens might make sense of the complex issues around air quality and explore our collective agency and capacity in tackling air pollution through both holistic and hyperlocal interventions. Through the engagement, participants make a statement on the air quality with their own physical actions of recording perceptual data using the wearable tools, help to fill in missing ‘gaps’ of air quality data in order to make sense of the quality of air in their neighbourhood and devise collective pledges that they can commit to helping tackle air quality issues for a period of time.

Over the past 6 months, we worked with a total of 90 participants (children, young adults, parents, activists and city officials) to pollution explore in their neighbourhoods in London, Macclesfield and Brussels using technological tools. The project has proven that people’s ability to assess the quality of air compared to the digital sensors is fairly high in some instances and a high percentage of participants have shown dedication in committing to an action to tackle air quality for a period of time in their everyday life. These are important findings from which participating residents and other cities can benefit greatly. Pollution Explorers is part of a large air quality initiative that we at Umbrellium have been doing over the past 3 years. Through the learnings, we aim to improve on our tools and work with more communities on pollution exploring and tackling air quality issues in their neighbourhoods and cities.

II. ARTWORK

Present the Artwork, including relevant background, in language accessible to a general audience. Define the goals of the residency and the main outcomes.

Pollution Explorers combines citizen engagement, IoT data, machine learning algorithms and low tech IoT wearable tools and is designed for communities and cities to act collectively on air quality issues in their neighbourhood. It consists of a set of custom-made wearable devices, pledge devices and engagement methodology intended to help improve a neighbourhood by working directly with the residents through a series of workshops, empowering them to make sense of air quality issues and more importantly, act upon them through behaviour change.

Through working in different neighbourhoods and cities, the project explores 3 key questions regarding people’s relationship with air quality:

- Can we assess the quality of air without the need for air quality sensors?

- What is the semantic description of air quality that goes beyond good or bad air?
- What can we do as a community to tackle air quality issues in our neighbourhood?

Over a span of 6 months, we have carried out 6 Pollution Explorers workshops in various cities, engaging with participants from a wide range of age groups to capture data that correlate to their perception of air quality:

- Poplar, London with local residents (aged 21 and above) in June 2018
- Macclesfield, UK with local residents (mostly adults, 1 child aged 12 years old) in June 2018
- Koekelberg, Brussels with high school students (aged 17-18 years old) from the UNESCO school in Oct 2018
- Sablon, Brussels with city officials and EU commissions (aged 21 and above) in Dec 2018
- Two workshops with students (aged 10-12 years old) from Marnier Primary School in Tower Hamlets London in Dec 2018



6 workshops carried out with different communities in different cities over the last 6 months

The outcomes from the workshops have been revealing. Through data analysis and observations, we have found that:

- People are not necessarily precise in determining the quality of air but **they are accurate in terms of comparison between air quality** i.e they are good at telling if air quality is better or worse than a location they were at before.
- People are especially good at making correct perceptions in areas with variability in the environment and that is badly polluted.
- Perception is completely relative. There are differences from location to location and when the base air quality is good, people feel a lot stronger about changes or worse AQ because of that relativity

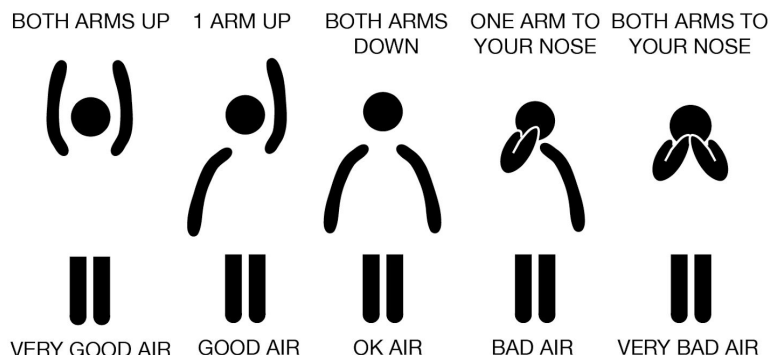
- **Children are very sensitive to momentary changes in the air** around them, such as a truck or car driving by, and **adults tend to be more holistic** about how they perceive the air around them. People are shown to have an emotional connection to certain smells (e.g perfume, barbecue or food smell) that contribute to bad air quality This can sometimes cause them to make an erroneous judgement about the air quality even if they knew the air was bad.
- When it comes to describing air quality using words that are not related to just good or bad, **people are shown to have difficulty describing air quality in spaces with complex environmental build ups** (e.g a park situated near the highway). An evaluation on the list of words contributed by all participants has shown that the combined words description are in some instance comparable to what an air quality sensor has captured.
- **Children are more committed to long-term actions to tackle air quality issues** (e.g planting or growing more plants and reducing electrical consumption) while **adults have shown to prefer short-term actions** (e.g reduce unnecessary car journeys, walk to work) but have shown to be less committed to keeping up with the actions for an extended period of time.
- **People who were more sensitive to air quality changes in their environment were shown to be more committed to actions to tackle air quality in their neighbourhood.**

III. METHODOLOGY

Methodology used to produce the Artwork.

In each workshop, participants are encouraged to make sense of air quality issues by collectively describing, discussing, and pollution exploring in their vicinity using technological tools. Depending on the length of each workshop, participants went through the various key activities:

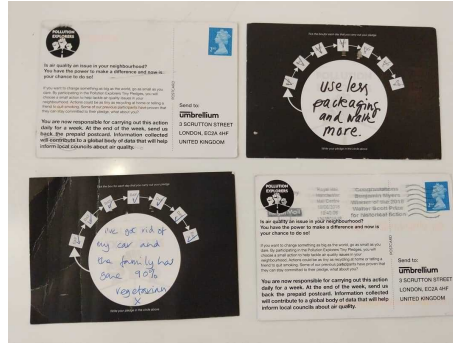
- An open discussion among participants regarding air quality in their neighbourhood
- Up to 2 Pollution Explorers outdoor walks
 - In walk 1, participants each write down 2 keywords that describe the air quality at that particular moment in different identified locations around the workshop space
 - In walk 2, participants each wear a custom-made wearable and perform the body gesture that relates to their perception of air quality in the same identified locations around the workshop space. The range of body gestures are described below:



- Two mobile air quality sensors were used to measure the quality of air during both walks
- A debrief session where participants collectively look at similarities and differences between each other's description of air quality, and the correlation between their recorded perceptual data (from wearables) and the air quality data (from air quality sensors).

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- We then end each workshop with participants discussing ways they can tackle air quality issues in their everyday life and choosing one action to commit to for a period of 7 or 21 days.
 - In the first 4 workshops, a prepaid postcard was given to each participant for them to track their actions for 7 days before sending it back to us.
 - For the last two workshops in Tower Hamlets, we look at coupling children's behaviour to their parents, by encouraging each student to commit to a specific action they can do with their parents for 21 days. Their actions were tracked over a period of 21 days using custom-made badges and poster.



IV. CO-CREATION PROCESS

Describe the functional aspects of the residency and the role of each partner, including resources, communication and production means.

The project was mainly designed and produced by Ling Tan with the support of Umbrellium which offers creative and production support such as fabrication of the wearables, development of software platform, community liaison for 5 of the workshops, workshop tech support, project dissemination, video and photo documentation and project coordination. hackAIR helped in community liaison for one of the workshops and project dissemination. FutureEverything helped in project dissemination.

V. IMPACT

How the residency impacts both parties.

A. Research Impact

Explain how the innovation could impact practice and ultimately improve Tech Project outcomes.

Pollution Explorers helps contribute to the innovation challenges of hackAIR because it combines a new perspective to an existing context by providing a new way of understanding air quality issues through perceptual experience mapping. Often times, urban air quality projects do not prove effective because they over-focus on data collection and visualisation, which do not lead to behaviour change to improve air quality. Pollution Explorers harnesses hyperlocal interventions and get people meaningfully involved in measuring, making decisions and acting collectively. It enables citizens to work collectively to build a holistic understanding of air quality condition in their neighbourhood through collective participation and be able to tangibly tackle air quality issues through their physical actions.

The type of wearable used in Pollution Explorers distinguishes itself from popular commercial wearables that merely provide notifications or passive sensing. As it gives wearers the added ability to send messages out (locally within proximity to some wearers) or globally (to all wearers) in the form of body gestures that are tracked by sensors from the wearable, enabling wearers to participate and engage as part of a bigger community while being mobile in the city.

B. Artistic Impact

Explain how the innovation could impact practice and ultimately improve artistic outcomes.

Pollution Explorers look at the issues of air quality from a new perspective that is both citizen-centric and technologically innovative through getting citizens to record situated air quality using sensors and mapping people's subjective experience using body gesture technology. The artwork is not the physical wearables and app, but the process and channel through which ordinary people get involved in the scientific and technological process. The focus is in figuring out various ways of structuring the engagement process with communities so that they feel that they have the rights to engage in authentic and subjective data collection and through the process invest in what is happening and have more sense of responsibility for the consequences.

VI. ART-SCIENCE INTER-RELATIONSHIPS

Place your collaboration in the general framework of art-science relationships.

Pollution Explorers demonstrate the possibility for a human to be an active sensor for measuring air quality. It inverts the conventional passive approach to using machine sensors to collect and visualise air quality data and instead consider citizens as active participants in collecting data, providing their opinions, and deciding as a community, as a group and as individuals about what needs to be done regarding the issue.

VII. FUTURE DIRECTION AND ACTIONS

What are the next steps after the STARTS Residency program?

Pollution Explorers is part of a larger air quality initiative that we at Umbrellium have been doing over the past 3 years that aims to improve air quality through hyperlocal intervention in neighbourhoods that harnesses collective behaviour change. Through the learnings from the residency program, we aim to improve on our technological tools and engagement methodology so that we can scale up to involve more stakeholders (e.g larger groups residents, local authority and businesses) in pollution exploring air quality issues in their neighbourhood and cities. Our aim is to create a meaningful tool for both citizens and cities to measurably improve air quality through collective community effort.



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VIII. CONCLUSION

A. *Concluding Remarks*

Please send to your STARTS Residency monitor, your article both in word format and in pdf, via email.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.
See attached document

ACKNOWLEDGMENT

Special thanks to:

- All the participants who took part in Pollution Explorers
- Umbrellium
- hackAIR
- R-Urban Poplar
- Cheshire East Council
- Atheneum Unesco Koekelberg
- Vias Institute
- Marner Primary School