

Can we improve air quality by influencing drivers to change their behaviour?

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Overview

Poor air quality has a wide range of negative effects on people's health and cognitive ability. Students may be subjected to poor air quality on their walking routes to school, whilst on buses and even whilst in school itself. Research carried out by our STEM partner and his colleagues has shown that road signs with a psychological message can reduce engine idling at long wait stops by up to 38%, which has the effect of improving air quality. This project builds on the research carried out by our STEM partner, focusing on one particular long-wait stop in Canterbury, Kent. We hope to find that psychology can be used to improve the environment and people's lives.

Aims

To investigate whether road signs with messages based on psychological principles can reduce engine idling at long-wait stops and therefore improve air quality.

Background information

The road signs used will consist of messages based on normative social influence and outcome efficacy, so it is necessary to understand these key concepts. Normative social influence involves a change in behaviour that is deemed necessary in order to fit in with a particular group. Outcome efficacy refers to one's belief that a particular behaviour will result in a desired outcome. It is also necessary to have some understanding of pollutants as determinants of air quality. The two measures used in this study are PM2.5 particulates and NOx. PM2.5 refers to tiny particles or droplets in the air that are two and a half microns or less in width and are air pollutants. NOx refers to nitrous oxides- gas pollutants formed during the combustion of fossil fuels.

Methodology

- (1) The students learned about open access publishing and searched relevant literature for peer-reviewed articles relevant to air quality, idling and behavioural change.
- (2) The basics of experimental design were taught by the STEM partner and lead teacher. This included the formulation of hypotheses, types of experimental design, types of experiments and sampling techniques.
- (3) The students designed a field study to reduce engine idling through psychologically derived messaging.
- (4) The students then decided on the wording of the road signs to be used and created the signs.
- (5) The students collected data for the control condition. This involved them standing at the chosen long-wait stop and counting the number of drivers that turned off their engine during a red light. They also collected air quality data by wearing their air quality monitoring devices.
- (6) The students repeated the data collection process for the experimental conditions, holding the signs they created.
- (7) The students are currently analysing the data collected, with support from the lead teacher and STEM partner.

Results

So far, the students have analysed the behavioural data (i.e. the number of drivers switching off their engines at the traffic light junction in the control and experimental conditions). The means for each condition are as follows: 9.2% (control condition), 38.9% (Sign 1) and 27.5% (Sign 2). A Chi-Square test was performed, and the results were significant at $p < 0.05$. This demonstrates that the number of drivers switching off their engines in the experimental conditions is significantly greater than the number of drivers switching off their engines in the control condition. Students are still analysing the air quality data and hope to find that air quality is significantly better in the two experimental conditions, compared to the control condition.

Conclusion

So far, we have found that the number of drivers switching off their engines in the experimental conditions is greater than the number of drivers switching off their engines in the control condition. This supports previous research by our STEM partner, which showed that road signs with psychological messaging reduced engine idling by 38%. We are still analysing the air quality data and we hope to find that air quality in the experimental conditions was better than in the control condition.

Evaluation

The traffic light junction we chose only required drivers to wait for 38 seconds, on average, so switching engines off may not lead to an improvement in air quality. Therefore, we would like to repeat the study at a longer-wait stop such as a railway crossing. We also intend to repeat the study with different messages, to see whether alternative wording is more influential. A problem we encountered was that some drivers assumed the students were environmental activists and the students faced some verbal abuse. Due to this, we intend to approach Canterbury City Council to see whether we could get permission to install permanent signage.