Methodology for the evaluation of Indoor Quality and comfort in schools’ classrooms

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OVERVIEW OF THE PROJECT

Research on Indoor Environmental Quality in schools usually refers to one or two aspects of the four (thermal, acoustic, visual and air quality), even the most recent research deals with these topics separately without considering all the factors that influence the environmental quality of the spaces. This research proposes a methodology to evaluate the indoor conditions in classrooms through surveys and measurements and presents a first approximation to an index to evaluate IEQ in an integrated way.

1. CONTEXT

The low the environmental quality (IEQ) of educational spaces has a negative effects on student’s welfare and learning outcomes. To define a comfortable space, it is necessary to state a methodology to assess IEQ for students and teachers in school classrooms, considering the four aspects that define IEQ: Thermal comfort, indoor air quality, visual comfort, acoustic comfort in an integrated manner, to then define standards that are verifiable, considering time of exposure that can ensure an educational space that delivers comfort to its occupants.

2. METHODOLOGY

Measurement of thermal comfort in school classrooms

Measurements of indoor conditions were conducted in classrooms in the city of Coyhaique, in the south of Chile. The survey design was longitudinal, were each student answered the survey between 1 and 15 times depending on their assistance in the 5 days studied. Measurements were preformed during the time and date of survey. The combined dataset was then analysed using Weighted mean, multiple regression and Binary Logistic Regression Analysis (BLR). Afterwards, and based on the results of the statistical analysis, an index was developed.

2.1. Survey

301 students were surveyed in 12 classrooms located in the city of Coyhaique, in the south of Chile. The survey design was longitudinal, were each student answered the survey between 1 and 15 times depending on their assistance in the 5 days studied. Measurements were preformed during the time and date of survey. The combined dataset was then analysed using Weighted mean, multiple regression and Binary Logistic Regression Analysis (BLR). Afterwards, and based on the results of the statistical analysis, an index was developed.

3. RESULTS

3.1. Thermal comfort

Indoor temperature was related with thermal comfort, acoustic comfort and air quality, but with a low association.

CO2 concentration was related with thermal comfort, but with no association.

ClO was related with thermal comfort, but with little association.

4. LIMITATIONS

The main limitation of this work is the quality of the gathered data. Real-world external events, prevented the researcher to access classrooms and gathering data that would have enriched the index. However, the amount of data available sufficed to develop a methodology.

Similar studies worked with similar /smaller samples, with data size between 50 and 65 self-reports per test subject. This ensures the representativeness of this study in the context of less studied regions of the world.

The initial results indicate that it would be interesting to further develop this index, to include measurement for acoustics and illumination.

Particulate Matters in outdoor air should also be considered for Coyhaique further research should also measure it inside the buildings. Since the buildings only had natural ventilation, contaminated air can be assumed based on outdoor conditions.

4.1. Students thermal comfort for this case studies does not correspond with previous calculations for Chile (Trebilcock, 2017)

4.2. Other parameters such as air quality, light and acoustics need to be further studied.