

UNIVERSITI TEKNOLOGI MARA

**INDOOR AIR QUALITY ASSESSMENT IN
SELECTED RURAL SCHOOLS IN NEGERI
SEMBILAN AND ITS IMPLICATIONS ON
CHILDREN'S HEALTH**

NUR NATASHA ZAFIRAH BINTI ZAINAL ABIDIN

Project submitted in fulfillment of the requirements for
the degree of
**Bachelor in Environmental Health and Safety
(Hons.)**

Faculty of Health Sciences

Jan 2023

ACKNOWLEDGEMENT

In the name of Allah, The Most Gracious, The Most Merciful.

Assalamualaikum and Alhamdulillah, all praise Allah S.W.T The Supreme Lord of the Universe. Peace and blessing to Nabi Muhammad S.A.W., all prophets and their families. I praise Allah S.W.T. for the strength and His blessings in completing my study.

Thousands of thanks and love to my parents Mr. Zainal Abidin bin Khalid and Mrs. for their support and encouragement through the thick and thin of my study. My deepest gratitude and appreciation to my dearest supervisor, Prof Madya Dr. Mohd Shukri bin Mohd Aris who spent her time and efforts in guiding and advising from the beginning till the end of my research journey. Not to forget, I would like to thank all the lecturers in the Department of Environmental Health and Safety, Faculty of Health Sciences who always share their thoughts, knowledge, and advice throughout my study in UiTM Puncak Alam. Only God can reward all of you with goodness.

My sincere thanks and appreciation go to all the staff from the department and laboratory who gave their full cooperation and assisted me in many ways throughout my study. A special thanks to my friends from HS243 who always give me support and motivation while completing my study. May our friendship last forever. Lastly, I would like to thank everyone who was involved directly and indirectly in this study. Thank You.

TABLE OF CONTENTS

TITLE PAGE	
DECLARATION BY STUDENT	ii
INTELLECTUAL PROPERTIES	ii
APPROVAL BY SUPERVISOR	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF ABBREVIATIONS	vii
ABSTRACT	viii
ABSTRAK	ix
CHAPTER 1	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Research Objectives	3
1.3.1 General Objective	3
1.3.2 Specific Objectives	3
1.4 Research Question	3
1.5 Hypothesis	3
1.6 Scope and Limitation.....	4
1.7 Significant of Study.....	5
CHAPTER 2	6
2.1 Background	6
2.2 Indoor Air Quality	6
2.2.1 Indoor Air Quality Definition.....	6
2.2.2 Factors Affecting IAQ	7
2.2.3 Indoor Air Quality Issues in School	8
2.2.4 Indoor Air Quality Legislative and Guidelines	8
2.3 IAPs Definition and Sources.....	11
2.4 Impacts Of IAPs on School’s Children	13
2.4.1 Disease Related to IAPs	13
2.4.1.1 Sick Building Syndrome	13
2.4.2 Adverse Health Effects on Children’s Health	14
2.5 Conclusion	15

ABSTRACT

Indoor Air Quality (IAQ) is defined as the description of pollutant concentrations and temperature conditions that may have a negative impact on the health, comfort, and performance of facility occupants. The researcher measured the concentration of indoor air pollutants (CO, CO₂, PM_{2.5}, PM₁₀, and bacteria); examined the effects of IAP on children's health; and investigated the relationship between concentration levels and the health impacts of IAP on children in selected rural schools in Negeri Sembilan. Quantitative research was conducted to fulfil the study's objectives. Quantitative data collected at two selected schools provided adequate information on concentration levels of IAPs and the health effects of IAPs on children (SKP4 and SKP5). Simple linear regression is used to examine the relationship between these variables. According to the findings, several indoor air pollutants exceeded the ICOP requirement for IAQ 2010, including temperature, relative humidity, and air movement. Furthermore, the children have reported symptoms such as drowsiness, irritation, stuffy nose, dizziness, headache, hoarseness, and dry throat. Moreover, some IAP variables at both schools had a significant association with presenting symptoms. Finally, IAQ assessments were successfully completed in the two selected rural schools in Negeri Sembilan, and the assessments met all the research objectives. Consider the fact that the IAQ may vary depending on the density of occupancy and activity at the sampling points. Thus, long-term IAQ monitoring programs and more frequent surveys of health symptoms are required to obtain more specific information on IAQ that is associated with health symptoms.

Keywords: Indoor air quality, indoor air pollutant, health effect, children, rural schools, Industry Code of Practice.

CHAPTER 1

INTRODUCTION

1.1 Background

Indoor Air Quality (IAQ) is described as the depiction of pollutant concentrations and temperature conditions that may have an adverse impact on the health, comfort, and performance of occupants in a facility (Petty, 2017). Researchers have focused on indoor air during the last decade, since people spend most of their time indoors, particularly at home, office, and school.

Furthermore, there are two types of building ventilation mechanisms: natural ventilation and mechanical ventilation. Inadequate ventilation system maintenance, sporadic daily cleaning operations, and a high density of students in a classroom all contribute to poor indoor air quality in schools. Generally, schools in Malaysia implement a natural ventilation system, which allows external contaminants to be transported into the inside environment by moving wind through open windows and doors (Alias et al., 2021).

Moreover, sick building syndrome is one of the health issues induced by poor indoor air quality (Suzuki et al., 2021). The World Health Organization (WHO) defines sick building syndrome (SBS) as "a combination of nonspecific symptoms including eye, nose, and throat irritation, mental tiredness, headaches, nausea, dizziness, and skin irritations, which appear to be connected with occupancy of particular buildings." (WHO, 1983). Mucosal symptoms (eye irritation, nasal catarrh and blockage, dry and sore throat), general symptoms (headache, weariness, nausea, dizziness, flu-like symptoms, and inability to concentrate), and dermal symptoms are the three basic types of SBS symptoms (itching and rash in the skin, face, hands, or scalp) (Fu et al., 2021). Previous SBS research has shown that humidity in the home and school might develop SBS among children in schools (Ketema et al., 2020). Therefore, the researcher intends to assess SBS among children in