



A HYGIENIC EVALUATION OF THE INDOOR AIR QUALITY IN PUBLIC SCHOOLS

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Abstract – Problems with indoor air quality control in public use facilities and serious air pollution have been identified in spaces where people live indoors. Schools must comply with the regulations necessary for health management, and staff members are responsible for protecting and promoting student health. The purpose of this study is to investigate the perceptions of students, parents, school staff, and Department of Education personnel of environmental hygiene management in the classroom, and to provide basic data according to the policies of environmental hygiene management through comparison and analysis of survey results. The survey period was November 6, 2017 to November 17, 2017. The survey method employed an online self-reporting questionnaire. The issue of classroom ventilation was addressed through the question “How good do you think the air ventilation in the classroom is?” The student response rate to the above questions was high. The results show that overall regulatory awareness (3.63) and regulatory accreditation (3.54) were high, while regulatory compliance (3.22) was moderate.

Keywords – Indoor Air Quality, School, Awareness, Accreditation, Compliance

1. INTRODUCTION

Many people in contemporary society live indoors. (1-2) Problems with indoor air quality control in public use facilities and serious air pollution have been identified in spaces where people live indoors. (3) First, it is believed that various types of management related to direct exposure will be required given the fact that children use such spaces. (4) Schools and daycare centers are important venues for education, and they are very significant for supporting the growth and development of students and promoting life. Students and staff spend most of their time indoors during the day, and they need to maintain and manage these dense spaces in hygienic and comfortable ways to promote sensitive, academic lives. (5-6)

Schools must comply with the regulations necessary for health management, and staff members are responsible for protecting and promoting student health. (7) Furthermore, teachers must maintain and manage indoor environmental hygiene based on school health law. The teacher should inform students, parents, school staff, and the office of education personnel about the status of environmental hygiene management and obligations such as interest, satisfaction, awareness, necessity, effectiveness, and compliance. (8-9) It is necessary for the teacher to suggest an improvement plan for the environmental hygiene management system and rational policy directions through investigation and analysis of awareness. (10)

As a result, it is believed that human life and satisfaction can be improved in immediate spaces through hygiene, and the effect of improvement is considered to be significant based on the development of various communities.

2. MATERIALS AND METHODS

2.1 Purpose of the research

The purpose of this study is to investigate the perceptions of students, parents, school staff, and Department of Education personnel on environmental hygiene management in the classroom, and to provide basic data according to the policies of environmental hygiene management through comparison and analysis of survey results.

Details of the definition are as follows. First, using preceding data, the school reviews relevant laws and regulations associated with the environmental sanitation management system. Second, the teacher investigates and analyzes the current status and awareness of environmental hygiene maintenance and management. Third, based on the above results, suggestions for improvement and policy are made.

2.2 A Study on the Concept of School Environment Sanitation Management in Korea and Related Laws

This study focuses on the concept of school environmental hygiene management. To review the relevant laws and regulations related to the school environment sanitation management system, I would like to summarize the related laws (“School Health Law,” “School Health Law New Act,” “Enforcement Rule of School Health Law”) as follows. In this study, the teacher should consider the indoor environmental hygiene and food hygiene management manual. The purpose of this study is to summarize and analyze the laws and regulations published by the Ministry of Environment and Hygiene management system.

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2.3 Research frameworks method

Survey of Teachers' Perceptions of the Environmental Sanitation Management System						
Details		Related Laws and Literature Survey ¹		Investigation and analysis of recognition ¹		Preparation of improvement plan ¹
Contents		<ul style="list-style-type: none"> ▪ Legal Consideration ▪ Data and literature survey ▪ Expert consultation and consultation 		<ul style="list-style-type: none"> ▪ A plan of investigation of recognition degree ▪ Questionnaire Development ▪ Online awareness survey and analysis 		<ul style="list-style-type: none"> ▪ Recognition results ▪ Expert consultation of results ▪ Problems and Improvements
Agency		<ul style="list-style-type: none"> ▪ Sample school² 		<ul style="list-style-type: none"> ▪ Online Web administration² 		<ul style="list-style-type: none"> ▪ Utilization agency²
Investigation and analysis of awareness of environmental sanitation management system						

1: Environmental Sanitation Management System

2: Ministry of Education and Korea Educational Development Institute and City and provincial office of education and support

Figure 1. Research frameworks method

2.3 Survey on the status and awareness of school environment hygiene management

The questionnaire was designed as a survey. The sample was collected from elementary schools, junior high schools, and high schools in Korea. The sample selected from schools included students, parents, teaching staff, and Office of Education personnel. Questionnaire items addressed by the subjects were composed of four types (students, parents, teaching staff, and Office of Education personnel); the status of environmental sanitation management and the awareness of the school were surveyed. The survey period was November 6, 2017 to November 17, 2017. The survey method employed an online self-reporting questionnaire.

2.4 Survey Results and Comparative Analysis

Statistical analysis was conducted using the statistical program SAS 9.3, and a simple t-test was conducted to test the normality of the factor distribution, including the nature and status of the questionnaire. This study has almost normal distribution, expressed by a geometric mean (GM) and the characteristic of 17 questions. In order to analyze the questionnaire factors, the dependent variables were gender and grade; more than 90% of the gender was female. In the analysis, 17 items were analyzed as independent variables with gender and grade as dependent variables. The analysis of the characteristics of respondents will be reviewed, and the results of the survey on the actual conditions of the work and living environment will be confirmed, which will confirm the results of the survey.

3. EXPERIMENT AND RESULT

3.1 Purpose of the research

Large cities, medium-sized cities, and towns and villages were classified according to their locations. Large cities represented 28.2%, medium-sized cities 36.7%, and towns and villages 35.1%.

Table 1. Distribution of survey subjects by region

-	Students	Parents	Teaching staff	Office of Education personnel	Total	Rate
Large cities	900	180	180	76	1,336	30.0%
Medium-sized cities	1,000	200	200	310	1,710	38.5%
Towns and villages	1,000	200	200	-	1,400	31.5%
Total	2,900	580	580	386	4,446	100.0%

3.2 Analyzing the questionnaire

The results of the survey and the analysis are as follows. The issue of classroom ventilation was addressed through the question "How good do you think the air ventilation in the classroom is?" In the results of analyzing the responses of 3,146 respondents, 944 (30.0%) answered "very good," 1,213 (38.6%) answered "good," 762 (24.2%) 184 (5.8%), answered "not very good" and 43 (1.4%), and 68.6% of the respondents were "very good" and "good" Responded positively. "How good do you think the air conditioning in the classroom is?" The results of analyzing the responses of 3,146 respondents included: "Very good" 676 (21.5%), "Good" 1,240 (39.4%), "Average" 985 (31.3%), "Bad" 204 (6.5%), "Very bad" 41 (1.3%). Of the total respondents, 68.6% answered "very good" and "good." To the question "What do you think is the best way to reduce air pollution in the classroom?" the results of the analysis of 1,084 respondents from among parents, teaching staff, and Office of Education

personnel included: “Non-response” 368 (33.9%), “Regular natural ventilation” 260 (24.0%), “Mechanical air purification product installation” 192 (17.7%), “Cleaning” 175. The rate of “regular natural ventilation” was the highest at 59 (5.4%), followed by “restraining physical activity in the classroom” and 30 (2.8%) “using building materials (fixtures).” To the question “How necessary do you think school environment hygiene management is?” the results of analyzing 3,146 responses of all respondents included “Not very necessary” 1,014 (32.2%), “Necessary” 1,142 (36.3%), “Normal” 860 (27.3%), and “Unnecessary” 103 (3.3% 0.9%). The proportion of “Necessary” was the highest; 68.5% of total respondents felt it was necessary.

Table 2. Correlation between students and classroom ventilation status

		Woman	Mean	Std Dev	p-value
Ventilation of the air in the classroom	Very good	216(23.3)			
	Good	356(38.4)			
	Average	267(28.8)	2.7264	0.0874	<.0001
	Not good	71(7.6)			
	Very bad	15(1.6)			
Environmental sanitation management of school	Indoor air quality	163(17.6)			
	Noise	99(10.7)			
	Food / water	212(22.9)	3.1092	1.2379	<.0001
	Restrooms	376(40.6)			
	Other	75(8.1)			
Management of school environmental hygiene	Very good	95(10.2)			
	Satisfactory	336(36.3)			
	Average	388(41.9)	2.5578	0.8542	<.0001
	Not very satisfactory	95(10.2)			
	Not at all satisfactory	11(1.1)			
Necessity of school environmental hygiene management	Very necessary	206(22.2)			
	Necessary	314(33.9)			
	Normal	361(39.0)	2.2703	0.8769	0.0008
	Unnecessary	37(4)			
	Not necessary at all	7(0.7)			

Table 3. Correlation between parents and classroom ventilation status

		Woman	Mean	Std Dev	p-value
Ventilation of the air in the classroom	Very good	37(24.8)			
	Good	75(50.3)			
	Average	30(20.1)	2.0537	0.8202	0.1665
	Not good	6(4.0)			
	Very bad	1(0.6)			
Environmental sanitation management of school	Indoor air quality	64(42.9)			
	Noise	8(5.3)			
	Food / water	33(22.1)	2.443	2.2168	0.0134
	Restrooms	35(23.4)			
	Other	9(6.0)			
Management of school environmental hygiene	Very good	32(21.4)			
	Satisfactory	73(48.9)			
	Average	37(24.8)	2.1342	0.8192	0.8341
	Not very satisfactory	6(4.0)			
	Not at all satisfactory	1(0.6)			
Necessity of school	Very necessary	54(36.2)	1.9195	0.8739	0.2437

environmental hygiene management	Necessary	61(40.9)
	Normal	27(18.1)
	Unnecessary	6(4.0)
	Not necessary at all	1(0.6)

Table 4. Correlation between teaching staff and classroom ventilation status

		Woman	Mean	Std Dev	p-value
Ventilation of the air in the classroom	Very good	91(36.8)	1.8462	0.776	0.1365
	Good	107(43.3)			
	Average	46(18.6)			
	Not good	2(0.8)			
	Very bad	1(0.4)			
Environmental sanitation management of school	Indoor air quality	139(35.6)	2.2227	1.499	0.5943
	Noise	10(4.0)			
	Food / water	22(8.9)			
	Restrooms	56(22.6)			
	Other	20(8.1)			
Management of school environmental hygiene	Very good	56(22.6)	2.0364	0.7562	0.4
	Satisfactory	135(54.6)			
	Average	48(19.4)			
	Not very satisfactory	7(2.8)			
	Not at all satisfactory	1(0.4)			
Necessity of school environmental hygiene management	Very necessary	13(5.2)	2.7854	0.9275	0.0014
	Necessary	82(33.2)			
	Normal	114(46.1)			
	Unnecessary	21(8.5)			
	Not necessary at all	17(6.8)			

Table 5. Correlation between Office of Education personnel and classroom ventilation status

		Woman	Mean	Std Dev	p-value
Ventilation of the air in the classroom	Very good	9(8.4)	2.7264	0.9001	0.476
	Good	32(30.1)			
	Average	46(43.4)			
	Not good	17(16.0)			
	Very bad	2(1.8)			
Environmental sanitation management of school	Indoor air quality	63(59.4)	2.1415	1.4828	0.4954
	Noise	3(2.8)			
	Food / water	10(9.4)			
	Restrooms	22(20.7)			
	Other	8(7.5)			
Management of school environmental hygiene	Very good	11(10.3)	2.4245	0.7678	0.2152
	Satisfactory	46(43.4)			
	Average	42(39.6)			
	Not very satisfactory	7(6.6)			
	Not at all satisfactory	0(0.0)			
Necessity of school environmental hygiene management	Very necessary	14(13.2)	2.3396	0.7793	0.21758
	Necessary	48(45.2)			
	Normal	38(35.8)			
	Unnecessary	6(5.6)			

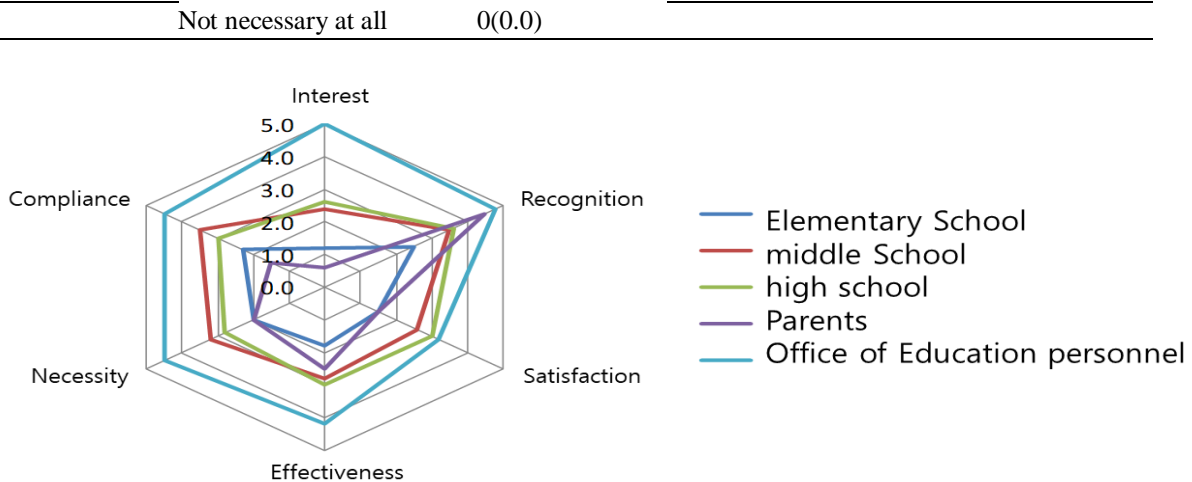


Figure 2. Research frameworks method

4. CONCLUSION

The conclusions of this study were classified according to the regulation. In the results, students' questionnaires were very positive as to their perception of the classroom environment, including ventilation, lighting, noise, etc., and all were statistically significant. On the other hand, the questionnaires of parents and Office of Education personnel were positive, but the results were not statistically significant. This is due to the nature of the Internet; the response rates of students, teaching staff, parents, and the Office of Education personnel in terms of personal evaluation index showed difference, and student indicators were more reliable because they were not compulsory. Regulatory awareness is quantitatively compared. The major variables for evaluation are as follows: It was important that some meaning was shown in each of the five questions. The results of the methodology of the scale were derived from specific perspectives, confirming the high functioning of the Office of Education personnel on the scale of relevance. As a result, overall regulatory awareness (3.63) and regulatory accreditation (3.54) were high, while regulatory compliance (3.22) was moderate.

5. REFERENCES

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