SCIENTIFIC CULTURE
www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 12, No.2. 1, (2026), pp. 2599-2617
Open Access. Online & Print

DOI:10.5281/zenodo.122.126201

THE NICS-SCHOOL MODEL MANAGEMENT FRAMEWORK FOR ENHANCING SCHOOL PREPAREDNESS AND HEALTH LITERACY IN FUTURE PANDEMIC CONTEXTS: A MIXED-METHOD STUDY IN THAILAND

Paleeratana Wongrith[1*], Phiman Thiraratanasunthon[2], Pathanasak Khammaneejan[3], Phuwasin Buakate[4], Shamarina Shohaimi [5]

[1]School of Public Health, Walailak University, Tha Sala, / Nakhon Si Thammarat, Thailand, 80160, Excellence Center for Public Health Research, Tha Sala Walailak University, Nakhon Si Thammarat, Thailand 80160, Email: paleerut@gmail.com, paleeratana.wo@wu.ac.th, Orcid: https://orcid.org/0000-0002-8242-2893
[2]School of Public Health, Walailak University, Tha Sala, / Nakhon Si Thammarat, Thailand, 80160, Excellence Center for Public Health Research, Tha Sala Walailak University, Nakhon Si Thammarat, Thailand 80160, Email: *phiman.th@wu.ac.th , Orcid: https://orcid.org /0000-0002-9813-4431*
[3]School of Public Health, Walailak University, Tha Sala, / Nakhon Si Thammarat, Thailand, 80160, Excellence Center for Public Health Research, Tha Sala Walailak University, Nakhon Si Thammarat, Thailand 80160, Email: pathanasak.kh@wu.ac.th, patkhamma@gmail.com, Orcid: https://orcid.org/0000-0002-2887-8275
[4]School of Public Health, Walailak University, Tha Sala, / Nakhon Si Thammarat, Thailand, 80160, Excellence Center for Public Health Research, Tha Sala Walailak University, Nakhon Si Thammarat, Thailand 80160, Email: phuwasin.Bu@wu.ac.th, Orcid: https://orcid.org /0000-0002-1515-4200
[5]Universiti Putra Malaysia, Serdang, Selangor, Malaysia, Email: shamarina@upm.edu.my, Orcid: https://orcid.org /0000-0003-0591-6627

Received: 20/10/2025
Accepted: 01/12/2025

Corresponding Author: Paleeratana Wongrith (paleeratana.wo@wu.ac.th)

ABSTRACT

Introduction: *Epidemics such as COVID-19 pose major challenges to educational institutions, impacting students, teachers, and parents. Strengthening the resilience of elementary schools to public health emergencies is essential in Thailand. This study investigates the relationships among school preparedness, health literacy, and policy implementation, emphasizing how these factors support effective pandemic response and recovery.* ***Methods:*** *A three-stage mixed-methods design using Participatory Action Research (PAR) was employed across seven provinces in Upper Southern Thailand. Quantitative analysis, guided by the Health Belief Model and health literacy concepts, was complemented by qualitative data from key stakeholders to develop and validate the NICS-SCHOOL model.* ***Results:*** *Most students demonstrated*

adequate health literacy (75.5%) and high preparedness (74%) toward COVID-19 prevention. Three school management patterns emerged—full-scale, semi-structured, and standard implementation. Structured environmental management significantly increased the likelihood of school reopening readiness (B = 2.047, p < 0.001). The NICS-SCHOOL model, consisting of 10 interconnected components, provides a comprehensive framework for multidimensional preparedness supported by both quantitative and qualitative findings. Conclusion: The NICS-SCHOOL model represents an innovative and practical framework for strengthening school resilience and health literacy in the post-pandemic era. It integrates N = Needs-based planning, I = Integration of systems, C = Communication strategies, and S = Sustainability to guide coordinated preparedness actions. Beyond improving individual schools, the model offers a scalable policy tool for ministries and education authorities to embed health promotion, environmental safety, and participatory governance into long-term education policy. By linking evidence with action, the NICS-SCHOOL framework can serve as a model for regional and global adaptation to future pandemics and emerging health challenges.

KEYWORDS: Health Literate School, Pandemic, Public Health Policy, Preparedness.

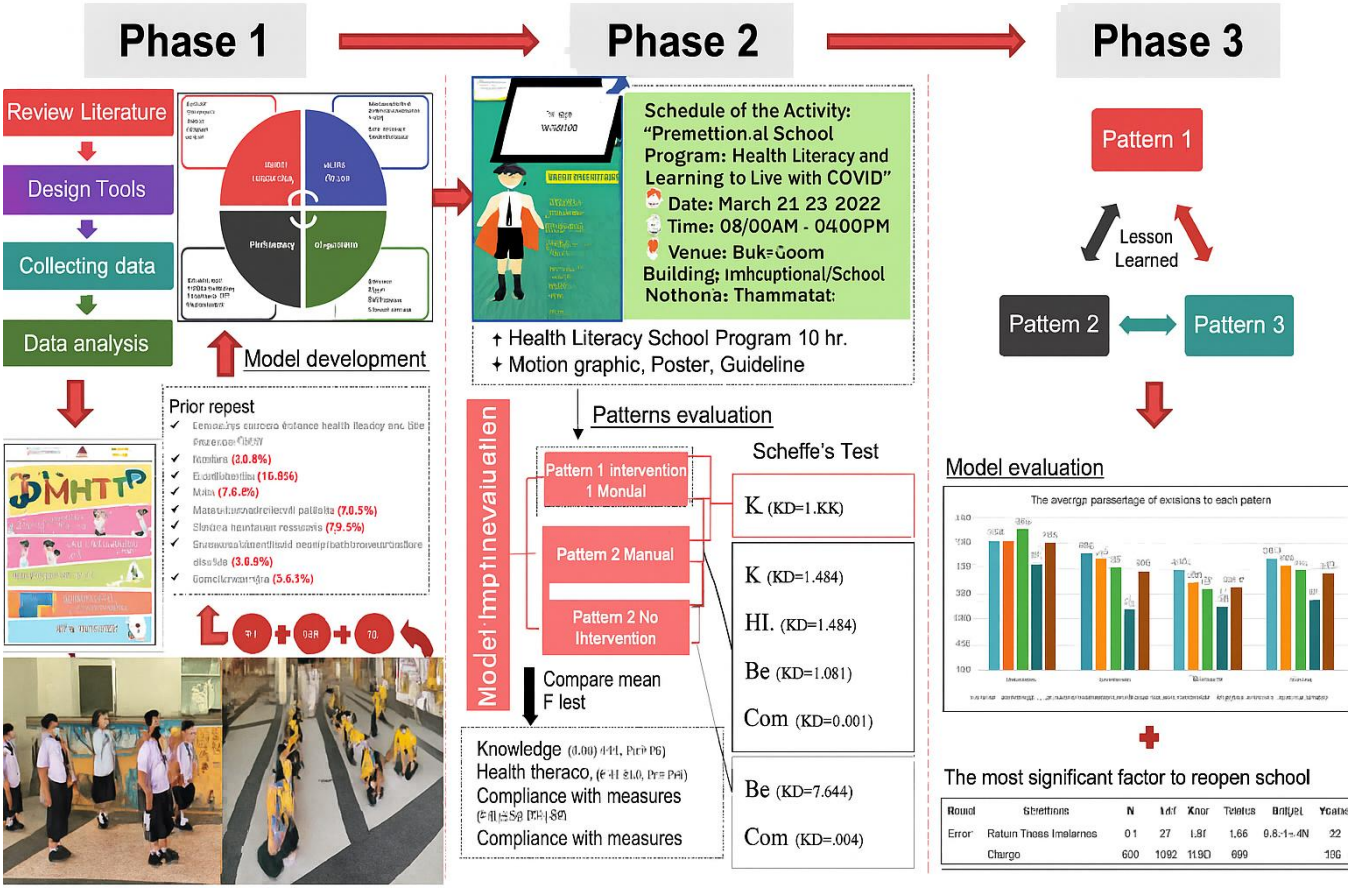

Figure 1: Graphic Abstract.

1. INTRODUCTION

The COVID-19 pandemic, especially in its third phase, has hammered countries worldwide, exposing decades-old gaps in public health infrastructure and worsening chronic social and health disparities (1). In light of these challenges emerged the importance of strong and flexible health systems within education and academic settings. This paper builds on the two key global health policy frames that have been central to responses to the Pandemic: Global Health Security, a policy which prioritizes the surveillance, detection and response to infectious diseases, and Universal Health Coverage, a policy which stresses ensuring that all people have access to the essential health services they need. How these global health paradigms framed in terms of national responses and intersected at various junctures revealed differential levels of preparedness and resilience — especially among LAMIC (2). The Thai government's policy for designing and implementing the response to the COVID-19 educational crisis was grounded in collaboration with the World Health Organization (WHO), as well as UNICEF and the international health and education policies (3). Thus, Thailand decided to implement in-school public health measures as a response to school preparedness to students' health(4). According to the readiness standards set in 2021, Thai government announce the school's 6:6:7 COVID-19 prevention measures, which consist of 6 main measures DMHT-RC (distancing, mask-wearing, hand-washing, testing, reducing congestion and cleaning), 6 additional measures, SSET-CQ (self-care, using serving spoons, eating freshly cooked meals, using a tracking system, check and quarantine) measures. Additional, the 7 strict measures (TSHE-SSS) include, 1) TSC+ Assessment, 2) Small Bubble, 3) Hygienic Meals, 4) Environmental Sanitation, 5) School Isolation, 6) Seal Route, and 7) School Pass (5, 6). As an illustration, DMHT-RC school safety measures closely correspond with WHO's "Considerations for school-related public health measures in the context of COVID-19" and UNICEF's guideline for school reopening to be safe, indicating transfer and adaptation of global strategies into the Thai context (7). Preparedness measures not only cover students, but also teachers, homeroom teachers, parents, and schools. Teachers

must be fully vaccinated, conduct weekly risk assessments using Thai Save Thai (TST), conduct periodic self-screening, and adhere to strict school safety measures. Homeroom teachers play a key role in assessing students' readiness for online learning, supporting blended learning, enforcing safety measures on-site, and reporting student progress to school administrators. In addition, parents must ensure that they and their children are fully vaccinated, support their children with weekly risk assessments and screenings, adhere to school safety measures, provide necessary learning tools such as devices and internet access, and follow school guidelines when communicating with teachers and administrators (6).

The role of health and literacy policies in mitigating the spread of the virus and building school resilience The importance of educational institutions and the risk of infectious diseases, especially during the COVID-19 pandemic (8). The global pandemic of COVID-19 has impacted education around the world, particularly over 1.5 billion students(3). Thailand's response to the COVID-19 pandemic in compliance with the regulative guidance for the prevention and control of outbreak and preparedness before reopening point of school opening, influenced on managing the schools in three stages with particular impact on a third phase (2022), addressing Endemic disease management, returning to school with preventive action And concomitant development of long-term health literacy in schools (9). This study explores how schools' readiness before school reopening, teachers' and students' health literacy, and participatory management support school reopening by school networks and their long-term resilience to future outbreaks (10). Health literacy, as defined by Nutbeam (2000), involves the acquisition of medical knowledge and the ability to interpret and apply health information to create healthy behaviors. Health literacy consists of six key components: access to health information, understanding medical advice, critically evaluating the reliability of information, applying health knowledge to make informed decisions, the ability to make appropriate health choices, and navigating the health care system (11). Regarding the awareness, the HBM (12) framework posits that the COVID-19 preventive involvement of vulnerable populations is determined by their perceived risk, perceived severity, perceived barriers and benefits of preventive behavior, as well as self-efficacy and trust and the sources of health information, including physicians, social media, and TV (13).

Health promoting schools (HPS) are found to be significantly related to each dimension of health literacy, and it is likely that a school principal who understands well enough the concept of health literacy is more capable of implementing comprehensive health promotion (13-16). Health literacy is a responsibility of government, as well as health professionals, media, and the public (17). Moreover, research demonstrates that health literacy can predict nursing students' preventive behaviors regarding COVID-19. Especially, asking questions and having a reliable source of health information will promote preventive practices (5). Additionally, students in grades 4–6 are in the most important age of development when lifelong health-protecting habits are needed. Nevertheless, adherence to preventive measures is not uniform because of limited knowledge about disease transmission, poor implementation of physical distancing, difficulties in hand hygiene practice, different levels of health literacy, and social pressure to not comply with these measures. Furthermore, lack of technology access and availability of educational resources exacerbate these challenges. Understanding the importance of health literacy in the HBM and HL models can be helpful for designing efficient education programs for varying the levels of health literacy (13). The objective of this research was to construct a school management model of disease prevention during an outbreak, as well as sustainable preparation for future outbreak episodes.

The purpose of this study was to:

1) Evaluate the circumstances and experiences of adjusting to school safety measures during the COVID-19 pandemic.
2) To develop and evaluate a new normal life model for upper primary school students against the COVID-19 outbreak through school-based management.
3) Investigate the influence of the NICS-SCHOOL model in Thai primary schools during the COVID-19 pandemic.

The primary importance of the present study is to help guide educational institutions with evidence-based evidence techniques to promote student safety and continuity in education in the post-COVID-19 era. The results will hopefully generate policy recommendations to enhance the education system and develop public health policies in the environment in Thai primary education.

2. METHODOLOGY

2.1. Research Design

This study was a mixed method investigation using participatory action research approach to comprehensively capture school adaptive strategies in response to COVID-19 epidemic. The trial took place June 5, 2021, through May 5, 2022. The participants were students in grades 4–6 and teachers from 7 primary schools in 7 upper southern provinces of Thailand: Nakhon Si Thammarat, Surat Thani, Chumphon, Krabi, Phang Nga, Ranong and Phuket.

2.2. Population, Sample Size, And Recruitment:

The study population was recruited in 3 phases:

Sample In Phase 1, the sample was comprised of 1,765 students and teachers from large primary schools in the upper southern provinces of Thailand and in Phase 2, the sample included 1,530 students and 235 teachers or staff from large primary schools in the upper southern provinces of Thailand, including Nakhon Si Thammarat, Surat Thani, Chumphon, Krabi, Phuket, Phang Nga, and Ranong. The management of COVID-19 during Phase 2 was hinged on Participatory Action Research (PAR).

In Phase 2, the research team selected the schools that were ready to The development of a prototype school model for new normal life management of COVID-19 in schools, the COVID-19 pandemic situation was conducted by specific selection through the following criteria: the readiness of the school and the management team and teachers to lead students to participate in a 10-hour participatory workshop, which is a total of two days. Types of samples: Participants in the volunteer study were pupils of Nakhon Si Thammarat municipality international school.

In the third phase, researcher applied the model, which was developed in 4 parts of the program: management of schools, development of schools for literacy (Health Literate School: HLS), management of environmental hygiene and health in schools (Environmental Health and Safety), and creative participatory management (Participation and Partnerships) in the second phase, to the other 6 schools at the first phase.

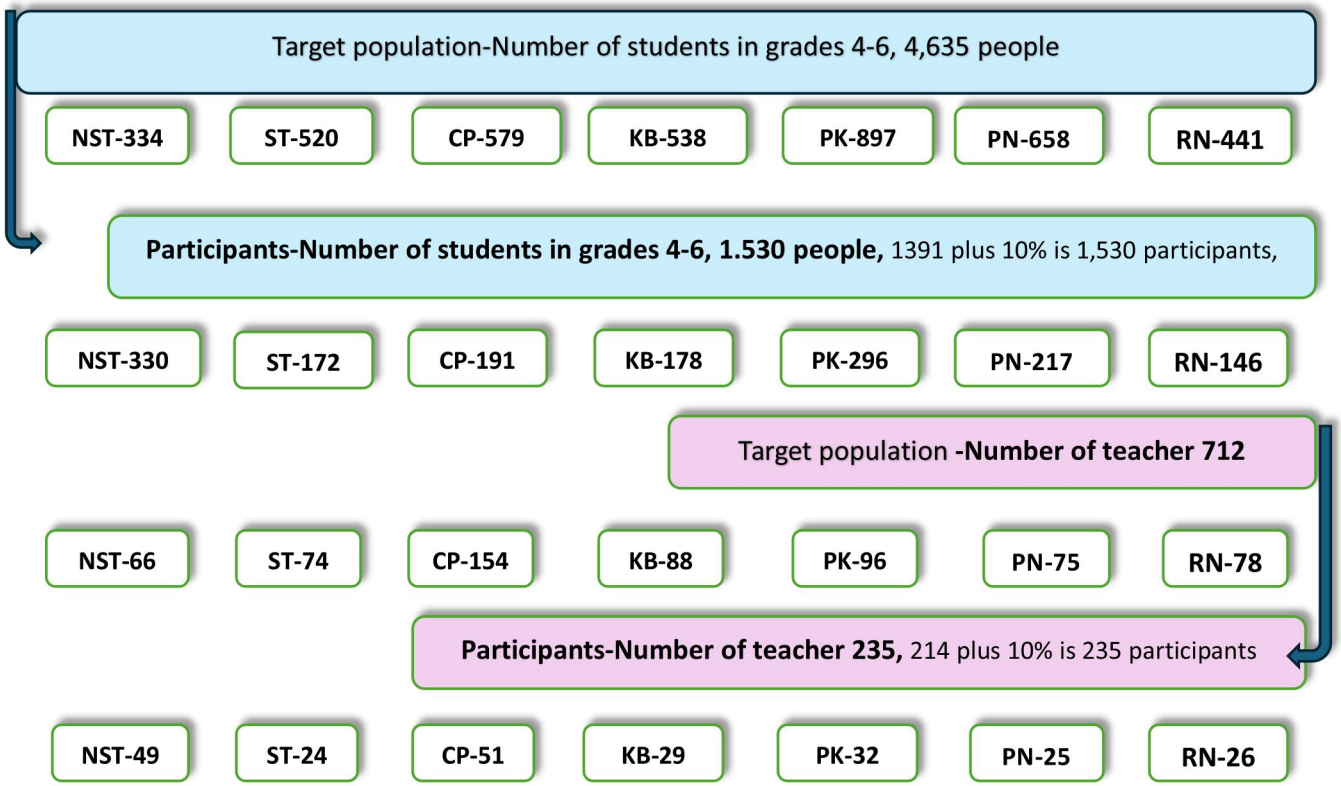

Figure 2: The Study Recruitment.

2.3. Implementation Process:

This study was conducted in three phases:

2.3.1. Model Development and Implementation

In Phase 1 (Cross-sectional and Qualitative Study), baseline data were collected to inform the design of a prototype school management model for the new normal in COVID-19 prevention. These results informed Phase 2 in which Participatory Action Research (PAR) was conducted to develop and test the model. The complete prototype model ultimately consisted of four interconnected

components: (1) School Leadership and Management, (2) Health Literate School (HLS), (3) Environmental Health and Safety and (4) Community Engagement and Partnerships. These were elements that were used to improve school manuals, policy provisions, emergent protocols, and create digital content (e.g., posters, e-books, videos). The Full-Model Implementation (Model 1) was piloted in one school and included direct workshops, visual tools (e.g., wall charts), and structured learning activities. The Semi-Model Implementation (Model 2) was tested in three kindergartens—Surat Thani, Chumphon, and Ranong—located in urban settings with balanced student populations. These schools received the same materials and guidelines but without in-person workshops. Instruction was delivered online, and students accessed the content through teacher guidance. Pre- and post-assessments (knowledge, attitudes, and practices) were conducted over one month. The Standard Policy-Based Model (Model 3) was observed in three other kindergartens—Krabi, Phang Nga, and Phuket—where schools followed Ministry of Education and Department of Disease Control guidelines without research-led interventions. Implementation was based on internal school policy led by the administrative teams. In Phase 3 (Implementation and Comparative Evaluation), the effectiveness of all three models was assessed across six schools from Phase 1, focusing on the same four key domains: leadership, health literacy, environment, and partnership. See Table 5 for a comparative summary of the model implementations.

2.4. Data Collection

The data is collected from 7 Schools of reform and concent by all participant and their parent through an online google from June 1, 2021 to May 31, 2022.

Phase 1, data collection for quantitative Data: Online teacher-administered survey using Google Forms for quantitative analysis, including frequency and percentage, mean (M), and standard deviation (SD) with online teacher-administered survey using Google Forms that was analyzed using quantitative methods, including frequency and percentage, mean (M), standard deviation (SD), and qualitative data were analyzed using inductive analytic methods to further develop guidelines for a prototype school for a "new normal" lifestyle in managing COVID-19, with Participatory Action Research (PAR) used to further develop guidelines for a prototype school for a "new normal" lifestyle in managing COVID-19.

Phase 2 was to diagnose students' self-management behavior to prevent COVID-19, health literacy rate and teachers and students' attitudes, prior to and following the training. The effectiveness of the prototype model and the differences in the average scores of individual areas after representative schools were established were analyzed by the results of the evaluation of health knowledge, literacy, student behavior before and after entering the prototype school. The school's characteristics were categorized into three-fold categories: school governance, health-literate schools (HLS), and environmental management and safety of the schools (environmental health and safety), and inclusive participatory administration, which is composed of four-constituent elements of the formative model of international schools. (Safe and healthy environment) and New Participatory Management.

Phase 3, the programme conducted Random selection of 15 to 20 individual from each school to explore instructors and student group leaders' perspectives. Qualitative Data: Online FGDs and IDIs with key stakeholders. Observations: Observed student hygiene and COVID-19 mitigation behaviors. Four indicators involving school management could be forecasted by ata obtained from the logistic regression analysis: 1) implementation of measures in schools, 2) growth of health literacy, 3) control of the school environment and safety, 4) network partner participation.

2.5. Data Analysis

Phase 1; Descriptive Statistics Frequency, percentage, mean and standard deviation. Statistical Analysis: School performance in hygiene intervention was compared using one-way ANOVA inferential statistics. Stage 2: Statistical Analysis and Behavioural Testing

Phase 2: Statistical Analysis and Behavioural Testing

1) Observation Data Collection Student compliance with COVID-19 safety measures (masks, physical distancing, hand hygiene) were observed. g). This was a cross-sectional study that was done with cluster sampling. To this end, the information of demographic-clinical characteristics, COVID-19 PHB (on the basis of HBM), and COVID-19 HLS was collected from participants through online research tools.
2) Inferential Statistics: One-way ANOVA were used to compare re mean scores across different COVID-19 management models in

schools. Binary logistic regression was performed to detect the predicting factors of the preventive behavior specific of responding the students during the COVID-19 epidemic.

3) When the variance analysis (ANOVA) indicates significant differences among three or more groups, post-hoc pairwise comparison by Scheffé's method is performed. This approach enables us to control for which particular subgroups differed between one another on variables such as levels of COVID-19 knowledge, health literacy, COVID-19 preventive behavior, compliance with COVID-19 recommendations.

Phase 3: Contextual and Thematic Analysis (PAR Phase) Qualitative Analysis (Thematic Analysis):

In the third phase, the results of the implementation were reviewed, including the success of the implementation of COVID-19 prevention in schools in all 7 areas of the upper southern region. The focus was on developing literate schools in accordance with the Ministry of Education's standards and the measures of the Disease Control Division and the Department of Health in the implementation. Qualitative data was also collected from the second phase consisted of Focus Group Discussions with the school heads, teachers and students. Thematic analysis using five-steps was used to distil the content of written discussions: (1) Familiarization: The first reading of the transcripts to get a grasp of the content. 2) Coding: Key terms were identified and responses were categorized. 3) Thematic Development: Clustering codes into overarching themes. 4) Interpretation: Combining the results and making sense out of them. 5) Validation: Themes compared with literature and with respondent feedback.

2.6. Quality Checking of Materials & Tools

Five sets of questionnaires (See Supplementary 1) were used in the study:

Set 1: A questionnaire for administrators, teacher leaders, and students; assesses readiness for school across six dimensions.

Set 2: Knowledge student questionnaire (Yes/No/Not sure; 5 items) and health literacy rated on a 3-point scale: No or rarely, Sometimes or often, Always or daily.

Set 3: Students' "new normal" behavior questionnaire (25 items), with the same 3-point scale from Set 2.

Set 4: Teacher health literacy questionnaire (No-Rarely; Sometimes-Often; Always-Daily)

Set 5: Structured questionnaire for teachers - computes perceptions and opinions about management and prevention key success factors of COVID-19 that is used as discussions guide for focus groups.

The tool was trailed with 36 participants (teachers and primary school students) at Wat Sutharam School on July 2 , 2021. Both on-site and online testing occurred. 2) Expert Review: Three independent expert reviews were conducted of the tool for each set of questionnaires and diversity and high reliability were guaranteed. Validity and reliability were obtained for 5 sets of the questionnaires: Set 1: School readiness (Administrators, Teacher leaders, Students) Validity: 0.89; Reliability 0.894, Set 2: Student knowledge and health literacy; (Valid: 0.86; 0.841), Set 3: Student new normal behavior (0.91; 0.864), Set 4: Teacher health literacy (0.86; 0.851) and Set 5: Teacher perception and COVID-19 management (0.70; 0.850). Data were analyzed post-study on M.S. Excel sheet for Windows and then transferred as SPSS worksheet using SPSS version 23. For analyzing the overall health behavior, the frequencies and percentages were computed. Results A p-value less than 0.05 was regarded as statistically significant.

3. RESULTS

To follow the study objective:

1) Evaluate the circumstances and experiences of adjusting to school safety measures during the COVID-19 pandemic.

3.1. Phase 1: School Preparedness and Health Literacy

According to the participants' research findings, the majority of the research students were female (54.5%), predominantly in Grade 6 (36.4%) or Grade 4 (34.4%), and aged 11 (29.3%), followed closely by those aged 10 (28.9%). Students from Nakhon Si Thammarat (21.5%), Phuket (19.3%), and Phang Nga (14.2%) had the highest participation rates. Chumphon (21.6%) had the largest percentage of teachers involved in the project, followed by Nakhon Si Thammarat (20.7%) and Phuket (13.5%).

Table 1: Number, Percent of Participant General Information (N = 1,530).

General information	Frequencies (n)	Percent (%)
Sex		

Male	696	45.5
Female	834	54.5
Age (year)		
9	192	12.55
10	442	28.89
11	448	29.28
12	427	27.91
13	21	1.37
Min=9, Max=13, Mean=10.76, SD=1.04		
Education		
Grade 4	526	34.4
Grade 5	447	29.2
Grade 6	557	36.4
Student each province		
Nakhon Si Thammarat	330	21.55
Surat Thani	172	11.23
Chumphon	191	12.48
Ranong	146	9.54
Krabi	178	11.63
Phan Nga	217	14.17
Phuket	296	19.33
Min=146, Max=331, Mean=218.57, SD=68.62		
Teacher each province		
Nakhon Si Thammarat	49	20.76
Surat Thani	24	10.17
Chumphon	51	21.61
Ranong	26	11.02
Krabi	29	12.29
Phan nga	25	10.59
Phuket	32	13.56
Min=24, Max=51, Mean=14.29, SD=4.85		

3.2. Capacity Building Through DMHT-RC Measures in Thai Primary Schools

High Overall Readiness: Schools demonstrated a high level of overall readiness (74.0%) in implementing DMHT-RC (Distancing, Mask-wearing, Handwashing, Temperature screening, reducing contact, and Cleaning) measures, indicating a foundation for building resilience. Specifically, schools showed strong capabilities in screening systems, consistent mask wearing, distancing protocols, and providing necessary screening equipment. The highest level of readiness was in the screening component (83.1%), followed by cleaning and ventilation (71.7%) (See fig .3A, more detail Table 2 in supplementary data)

3.3. Health Beliefs, Health Literacy, And Behaviors, In Thai Primary School Students During COVID-19

3.3.1. Strong Health Belief Model

Students held strong positive health belief patterns concerning COVID-19. This included high perceptions of risk, strong motivators for prevention, low perceived barriers, belief in the benefits of prevention and treatment, *High Self-Efficacy, And A Clear Understanding of the Severity of the Disease. (See Fig. 3B, More Detail Table 3)*

3.3.2. High Health Literacy

The study found that students had an average

health literacy all 6 components, of 75.5%, with 88.5% having a high knowledge and understanding of COVID-19. However, the frequency of accessing information was relatively low, with only 754 students accessing information. Communication skills were also high, with 73.8% communicating about COVID-19. Media literacy was also high, with 60.8% using it. Decision-making and behavior to prevent COVID-19 were also high. Teachers had an average score of 4.97, with 172 people having an average score of 45.6%. Communication skills ere good, with 21.44 to 67.4% having good health literacy and self-management skills. Students had high opinions on preventing COVID-19 in all aspects, including living a new normal life, awareness of support, and behavior. (See fig. 3 C, more detail see Table 4)

3.3.3. Preventive Behaviors

The study assessed compliance with six main measures to prevent COVID-19 spread in educational institutions. Students showed high levels of behavior towards the outbreak, with a mean of 93.2% with 75.5% showing high-level adaptation. They had high opinions on preventing COVID-19 in all aspects, including living a new normal life in school, being aware of support for prevention, and exhibiting behavior to prevent COVID-19. Overall, students' attitudes towards the outbreak were high. (See fig. 3D, more detail sees Table 5)

2) To develop and evaluate a new normal life model for upper primary school students against the COVID-19 outbreak through school-based management.

The study aimed to develop and evaluate a new normal life model for upper primary school students in the upper southern provinces against the COVID-19 outbreak through school-based management. The program was divided into three models: Model 1, where one school with readiness used the Knowing Schools, Learning, Living with COVID program, and the other six schools used the Ministry of Education's standard model without action. The research results showed that the schools that developed the knowledge program had an effective program with a significantly higher average score between the groups than the other two models. The average score of knowledge and COVID-19 prevention behavior after training using the Knowledge School Program was significantly higher than before the program.

3.4. The New Normal Lifestyle Model Based on Knowledge Level, Health Literacy Level, COVID-19 Prevention Behavior Level and Compliance with Preventive Measures

The result of the test of mean scores for each pair after analysis of variance of the new normal life model using the Scheffe's method of knowledge level variables found that Model 1 had a higher mean score than Models 2 and 3 at a significant level ($P<.05$). In terms of health literacy, Model 1 had a higher mean score than Model 3 at a significant level ($P<.05$). The variables of COVID-19 prevention behavior and the variables of compliance with Model 1 measures had higher mean scores than Models 2 and 3 at a significant level ($P<.05$). In conclusion, the school management model in Model 1, which is the COVID-19 Knowledgeable Schools Learning with COVID program, is the most effective. Model 2, the semi-full model, in which the school has complete documents, materials and tools and allows students to access them by themselves, is less effective when compared to Model 3, the standard model under government regulations. (see Table 2-4)

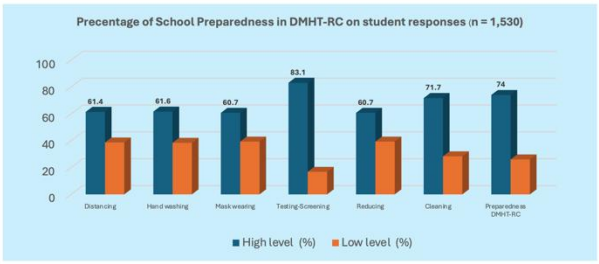

Fig. 3A Percentage of School Preparedness in DMHT-RC on student responses

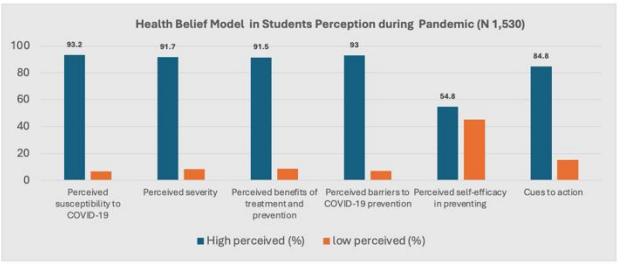

Fig. 3B Percentage of students on health belief models regarding COVID-19

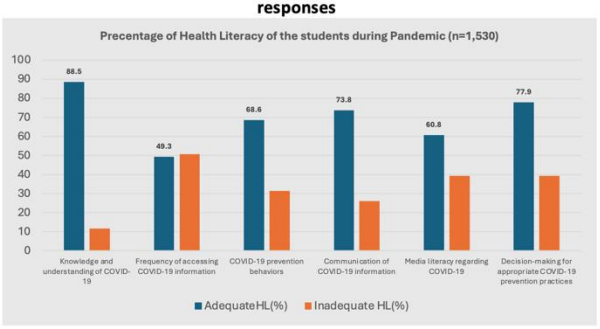

Fig.3C Percentage of health literacy in adapting to the new normal lifestyle during the COVID-19 outbreak

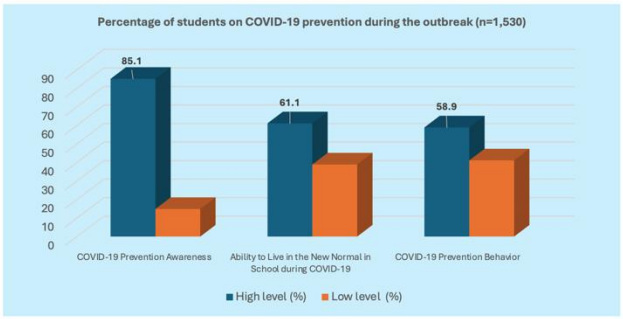

Fig.3D Percentage on COVID-19 prevention during the outbreak

Figure 3: Percentage of School Preparedness, HBM, HL, And Prevention Behavior During Pandemic.

Table 2: One-Way Analysis of Variance of the New Normal Lifestyle Model Based on Knowledge Level, Health Literacy Level, COVID-19 Prevention Behavior Level, And Compliance with Preventive Measures (N=280).

Variables	Source of variables	SS	df	MS	F	p-value
COVID-19 Knowledge level	Between group	83.259	2	41.629	12.618	<.001*
	Within group	913.852	277	3.299		
	both	997.111	279			
COVID-19 Health literacy level	Between group	84.031	2	42.016	3.488	.032*
	Within group	3336.794	277	12.046		
	both	3420.825	279			
COVID-19 Prevention Behavior level	Between group	4967.451	2	2483.725	13.234	<.001*
	Within group	51988.374	277	187.684		
	both	56955.825	279			
Cues to action level	Between group	131.262	2	65.631	9.632	<.001*
	Within group	1887.506	277	6.814		
	both	2018.768	279			

***P-Value<0.05**

Table 3: Post-Hoc Pairwise Comparison After Analysis of Variance of Knowledge Level, Health Literacy Level, COVID-19 Preventive Behavior and Compliance Level.

Table 3.1 Post-Hoc Pairwise Comparison After Analysis of Variance of The New Normal Lifestyle Pattern for the Knowledge Level Variable Using Scheffé's Method.

Knowledge level After		Model 1	Model 2	Model 3
	$\overline{X}$	17.43	15.76	16.16
Model 1	17.43	-	-	-
Model 2	15.76	1.661*	-	-
Model 3	16.16	1.263*	-.398	-

***P-Value<0.05**

Table 3.2 Post-Hoc Pairwise Comparison After Analysis of Variance of the New Normal Lifestyle Model for the Health Literacy Level Variable Using Scheffé's Method.

HL level After		Model 1	Model 2	Model 3
	$\overline{X}$	41.83	40.96	40.22
Model 1	41.83	-	-	-
Model 2	40.96	.866	-	-
Model 3	40.22	1.603*	.737	-

***P-Value<0.05**

Table 3.3: Post-Hoc Pairwise Comparison Following the Analysis of Variance of the New Normal Lifestyle Model for the COVID-19 Preventive Behavior Variable Using Scheffé's Method.

Prevention behavior level After		Model 1	Model 2	Model 3
	$\overline{X}$	126.07	123.27	115.62
Model 1	126.07	-	-	-
Model 2	123.27	2.807	-	-
Model 3	115.62	10.451*	7.644*	-

***P-Value<0.05**

Table 3.4: Post-Hoc Pairwise Comparison Following the Analysis of Variance of the New Normal Lifestyle Model for the Compliance Level Variable Using Scheffé's Method.

Preventive Measures Compliance		Model 1	Model 2	Model 3
	$\overline{X}$	34.68	33.55	32.66
Model 1	34.68	-	-	-
Model 2	33.55	1.122	-	-
Model 3	32.66	2.017*	.895*	-

***P-Value<0.05**

Table 4: Post-Hoc Pairwise Comparison After Analysis of Variance of the New Normal Lifestyle Model for the Compliance Level Variable Using Scheffé's Method.

Models	Variable(s)	B	S.E	Wald	EXP(B)	95%CI	p-value
Step 1	School management	-.138	.301	.211	.871	.483-1.570	.646
	Health literate school	.367	.326	1.267	1.443	.762-2.733	.260
	Safety and clean environment	.783	.293	7.120	2.188	1.231-3.888	.008
	Partnerships participation	-.248	.177	1.977	.780	.552-1.103	.160
	Constant	-8.359	2.536	10.862	.000		.001
Step 2	Health literate school	.273	.253	1.171	1.315	.801-2.157	.279
	Safety and clean environment	.771	.292	6.958	2.162	1.219-3.835	.008
	Partnerships participation	-.247	.175	1.995	.781	.554-1.101	.158
	Constant	-8.772	2.450	12.815	.000		.000
Step 3	Safety and clean environment	.928	.258	12.987	2.530	1.527-4.191	.000
	Partnerships participation	-.226	.175	1.671	.797	.566-1.124	.196
	Constant	-7.680	2.111	13.242	.000		.000
Step 4	Safety and clean environment	.716	.184	15.194	2.047	1.428-2.934	.000
	Constant	-7.671	2.034	14.221	.000		.000

***P-Value<0.05**

3) Investigate the influence of the NICS- SCHOOL model in Thai primary schools during the

COVID-19 pandemic.

3.5 Factors Affecting School Reopening

The project aimed to develop a new normal life model for upper primary school students in the upper southern provinces to combat the COVID-19 outbreak through school-based management. The program was divided into three models: Model 1, where one school with readiness used the Knowing Schools, Learning, Living with COVID program, and the other six schools used the Ministry of Education's standard model without action. The research showed that schools that developed the knowledge program had an effective program with higher average scores and higher knowledge and COVID-19 prevention behavior. (See Table 5)

Table 5: Binary Logistic Regression of Factors Affecting School Readiness for Reopening.

Models	Variable(s)	B	S.E	Wald	EXP(B)	95%CI	p-value
Step 1	School management	-.138	.301	.211	.871	.483-1.570	.646
	Health literate school	.367	.326	1.267	1.443	.762-2.733	.260
	Safety and clean environment	.783	.293	7.120	2.188	1.231-3.888	.008
	Partnerships participation	-.248	.177	1.977	.780	.552-1.103	.160
	Constant	-8.359	2.536	10.862	.000		.001
Step 2	Health literate school	.273	.253	1.171	1.315	.801-2.157	.279
	Safety and clean environment	.771	.292	6.958	2.162	1.219-3.835	.008
	Partnerships participation	-.247	.175	1.995	.781	.554-1.101	.158
	Constant	-8.772	2.450	12.815	.000		.000
Step 3	Safety and clean environment	.928	.258	12.987	2.530	1.527-4.191	.000
	Partnerships participation	-.226	.175	1.671	.797	.566-1.124	.196
	Constant	-7.680	2.111	13.242	.000		.000
Step 4	Safety and clean environment	.716	.184	15.194	2.047	1.428-2.934	.000
	Constant	-7.671	2.034	14.221	.000		.000

***P-Value<0.05**

3.6. A Significant Impact on Learning Management

The COVID-19 pandemic has significantly impacted learning management in basic education institutions in seven provinces in the upper southern region. Positive impacts include adjusted educational plans, improved teaching methods, and improved internet network systems. Teachers have developed knowledge and skills in managing various forms of learning, increased cooperation, and learned more about technology. However, negative impacts include increased workloads, increased risk, and concerns about students' academic performance.

On the other hand, positive impacts on parents, communities, and society include increased communication, support from local areas, and improved relationships between parents and educational institutions. Schools in Thailand have effectively managed their environments, implemented strong communication systems, and developed response planning for normal, mitigated, and heightened COVID-19 risk situations. However, there are significant gaps in policy responsiveness and resilience-building efforts, particularly in physical risk situations and students with insufficient health literacy.

The results show that schools are prepared for challenges, but true resilience lies in filling these gaps. Future policies and models are crucial for enhancing school resilience and epidemiological impacts in Thai primary school students during and after the pandemic.

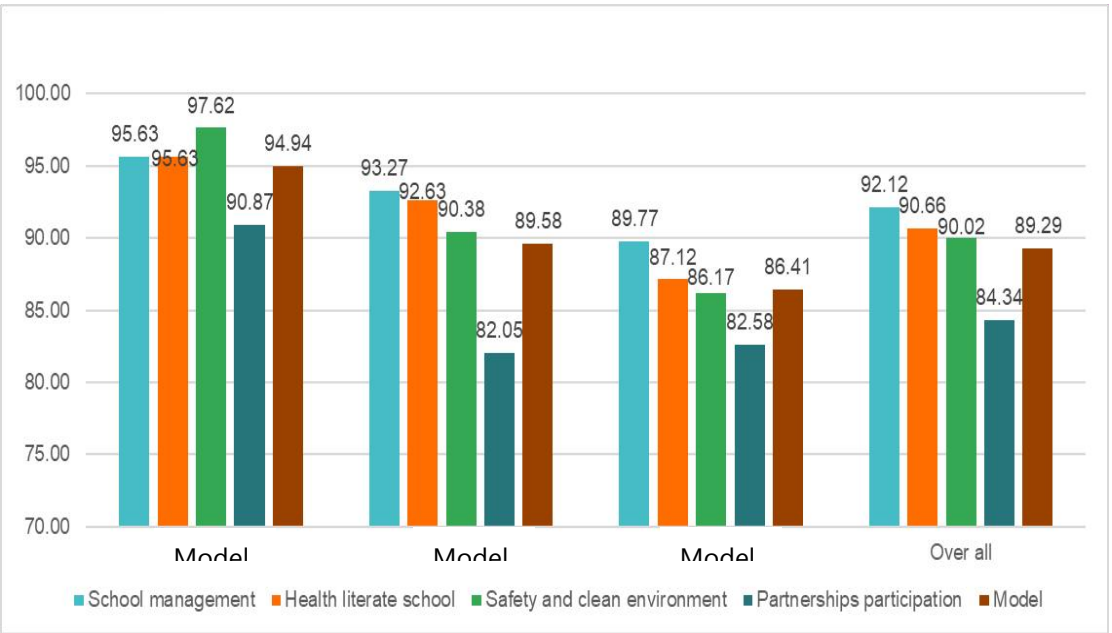

Figure 4: Comparison Chart of Teachers' Average Opinion Scores on Model Development by Three Models With 4 Aspects.

3.7. School Management Model Development

3.7.1. Policy, Health Literacy, And School Preparedness in Thai Primary Schools During COVID-19

The study reveals mixed results on school preparedness and student health literacy during the COVID-19 pandemic. While 74% of schools were rated ready, gaps were found in social distancing enforcement (26%) and student health literacy (24.5%). High health literacy was found in upper primary grades, with positive behaviors related to COVID-19 prevention. Positive health beliefs were also present, with a high perception of risk and strong motivation for prevention. Schools with an organized approach to environmental management had twice the odds of successful reopening, emphasizing the importance of systematic action. The results highlight the effects of globalization on school health management practices, with standardized use of preventative measures like mask mandates, social distancing, ventilation, and online education (7).The NICS-SCHOOL Model, a framework for resilience building in Thai primary schools, combines key themes from qualitative data into an evidence-based guide for schools to manage these changes proactively. The model aligns with global health education frameworks, suggesting it may be a promising candidate for adaptation to other LMICs facing similar challenges (18).

3.8. Model Comparing

The study identified three major school management models, they are: Full model: Strengthening of health literacy programs, school safety improvements, and participatory management to ensure comprehensive preventive initiatives. Most of these schools had shifted to hybrid learning models to address pandemic-related disruptions. Semi-structured model: Positional preventive work, employment of basic preventive interventions; health policy was concurrent but principally teacher-driven with limited community involvement. Normalizer: Minimal additional adaptations to government guidelines, resulting in low levels of engagement and low levels of preparedness. All schools in this category struggled with learning continuity. Theme: Building Resilience Through Multi-Dimensional Strategies: A Comprehensive Analysis of Policy, Health Literacy, and School Preparedness in Thai Primary Schools During COVID-19 (see Figure 4(4A-4B)

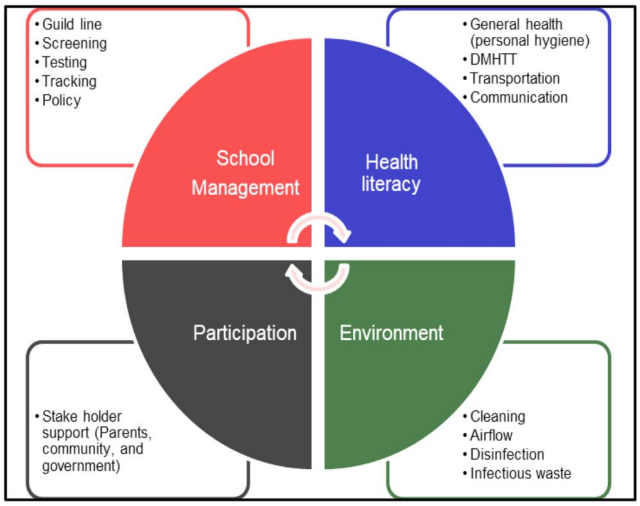

Figure 5a: The Nics-School Model: A Multi-Dimensional Framework for Resilience in Thai Primary Schools.

Figure 5b: The Health Literate School Framework for Building Resilience in Thai Primary Schools During the Covid-19 Pandemic.

The NICS-SCHOOL Model: A Multi-Dimensional Framework for Resilience in Thai Primary Schools

Due to the qualitative study results found under the theme requirements **NICS-SCHOOL as Figure 5B** were stand for, New Normal Communication, Improved life skills, Stakeholders and Networks, Sanitation and hygiene, Caution and Control, Health Literate School, Operating, organization practice, and Legislation, which can bring the development program to three models due to a multi-dimensional Framework That's create sustainability by utilizing participatory development in four key elements as **Figure 5A** to mitigate the potential negative impacts of future changes in the communicable disease situation.

4. DISCUSSION

Findings underscore the importance of integrating **health literacy and structured management** within school settings. Schools that engaged in **participatory approaches** and adopted robust safety protocols exhibited greater resilience in reopening efforts. This study highlights the need for:

4.1. School Preparedness and Readiness

An online teaching format was utilized in waves 1-2. There were no confirmed infections in representative schools across the seven upper southern provinces, indicating the severity of the COVID-19 outbreak in communities and educational institutions. Similarly to the study in India that school closures in response to COVID-19 impacted children's education, protection, and well-being, children were not super spreaders (19). However, during the third wave, infections were reported among both teachers and students. Schools in all seven areas implemented a high-level screening system, enforced mask-wearing, maintained physical distancing, and arranged locations and equipment for screening. The schools managed their environments effectively, ensuring cleanliness and proper ventilation in classrooms and reducing crowding, with high scores in each area. The management model for response plans addresses normal, relaxed, and crises situations when there is a risk and infection situation in schools at a high level. There was also an effective communication model in place for teachers and students via loudspeakers and public relations efforts.

4.2. Sustainable Health Literacy Organizational Development Measures

Health-literate schools play a critical role in fostering students' health literacy, supporting behavior change through reliable information and structured health education programs The integration of HBM-based education, strong school-community collaboration, and digital learning innovations enhances preventive behavior and public health resilience (20, 21). Effective networks among educators, health providers, and parents are key to sustained health promotion. Additionally, students' strong health beliefs and literacy are essential for resilience and adapting to future public health challenges (22). Therefore, students showed strong Health Beliefs and positive Health Literacy and preventive behaviors.

4.3. Explanation of the NICS-SCHOOL Model's Effectiveness

The impact of the COVID-19 situation on learning management in basic education institutions in 7 provinces in the upper southern region.

4.3.1. Positive impacts on learning management of educational institutions found that educational institutions 1) adjusted their educational management plans and goals, 2) adjusted their teaching methods and learning assessments to be more appropriate for the situation, 3) improved their internet network systems to be of higher quality, and some educational institutions/affiliations received more budgets for education management. Educational institutions under local administrative organizations received budgets to support the improvement of the internet system and the development of IT media, 4) adjusted their classroom sizes, and 5) used new learning management formats and technologies, making learning management more interesting and using more new assessment methods (22).

4.3.2. Positive impacts on the development of well-rounded schools NICS-SCHOOL Model increased school readiness by promoting collaboration between teachers, flexible instruction, and technology use. It facilitated student participation, saved travel expenses and increased learning availability. But, higher load of work and stress in the teachers were recorded, as well as students´ concern about less physical training and their study motivation. Monopoly squeeze on families became another issue. The usefulness of the model for fostering resilience in education was demonstrated, despite these challenges. Its success hinges on context appropriate implementation that is sensitive to the contexts in which schools operate while keeping safe, effective and inclusive learning as the primarily objective during future public health emergencies. Consistent with the previous study suggested While suggested solutions have the potential to provide a cleaner and safer learning environment, it is essential to exercise caution when implementing these measures and adapt them to the specific circumstances of each school (23).

4.3.3 Positive impacts on parents, communities and society It was found that 1) parents communicate to receive more news from the educational institution. 2) The community and local areas support the budget and provide more cooperation and assistance to the educational institution. 3) Parents understand and have a better relationship with the educational institution (21).

NICS-SCHOOL Model Components and Qualitative Integration: Theme of the third phase we found 10 elements of the finding in health literate school in 7 provinces, especially the model NICS SCHOOL in Nakhon Si Thammarat, as following; The finding was consistent with the previous study that the policies could be grouped into several key categories: educational programs, laws and regulations, knowledge sharing, national programs, and different information sources. The development of these policies involved multifaceted processes influenced by political, scientific, economic, cultural and social factors, as well as the involvement of multiple stakeholders (24).

- N: New Normal: Adapting to a Changed Reality: This Mindset, which describes making adjustments to locations and behaviors, mirrors the qualitative focus of the factors on the practices of learning and schools in the “new normal.” The move to online learning over the pandemic changed students' experiences, building a sense of community online, and getting them used to digital work. Not only did the transition help students feel connected and supported, but it also helped students build resilience by providing a safe haven from negative news and preparing students to face uncertainties ahead. Although many felt that online classes had increased their confidence about pursuing a career, opinions differed. related studies support the concept of "New Normal" adaptation, specific responses should include flexible learning that utilizes available technology to continue education in dynamic contexts (25).
- I: Improving Life Skills: Cultivating Student Well-being: This element focusing on building students' coping strategies and emotional resilience aligns with the qualitative data which illustrated the criticality of student health and dealing with stress. As their relationships with family, friends, patients and coworkers changed during the pandemic, these students reported feeling less support and more isolated. Understanding the Salience of these Relationships is Vital in Building for Student Well-Being This aligns with component Basin part 4 of the LEVEL UP rubric, which emphasizes kind of coping mechanisms and emotional resilience. Educational institutions can enhance student well-being and success

by implementing these practices and promoting mental health and stress management strategies, which establish a supportive context for students facing challenges in their academic and personal lives (26).

- C: Communication: Proper Risk Communication: The complexity involved in the need for precision of language regarding pandemic messages is reinforced by this study as scientific uncertainty, fear of risk amplification and differing levels of public health and scientific literacy shape the ability to communicate despite the difficulties. It coincides with the Communication (C): Effective Risk Communication section of the risk-based training was presenting the same information clearly and consistently is key. The qualitative findings strengthen the need for strategic communication to ensure the public health messages are accessible, accurate, and capable of facilitating informed decision-making during health crises (27).
- S: Stakeholders and Networks: Collaborative Partnerships: It identifies five major groups — the policy community, professional network, network, network producer, and network issues — and concentrates on mapping stakeholder functions that enable networking of actors. This goes hand-in-hand with the "Stakeholders and Networks (S): Collaborative Partnerships" from the S-A-V-E model of storytelling in our course which highlights how valuable collaborations are. These qualitative findings support how effective stakeholder engagement and partnerships are critical to strengthen networks, coordinate responses and promote collective efforts for public health challenges (28).
- S: Sanitation and Environmental Hygiene: Safety Starts at Home: The "S: Sanitation and Environmental Hygiene: Ensuring Safe Environments" focus on hygiene protocols and preventive measures matches the broader needs of pandemic preparedness in schools. By contributing to a safer and more inclusive learning environment, promoting WASH can improve students' performance, demonstrating that sanitation is a key component of a school-based health strategy (29).
- C: Caution & Control: Control are Preventive Measures This aspect of enforcement of preventive measures is congruent with qualitative results concerning safety protocols. Fires, explosions, spillage of products, industrial hygiene dangers like chemical sputum and radiation, and mechanical breakdowns are fraught with dangers that pose obstacles in industrial sectors, and different interventions including engineering controls, administrative controls, PPE, and behavioral interventions have been used to address these challenges (29, 30).
- H: Health Literate School: The health knowledge dimension of this qualitative focus is reinforced by this component which emphasizes the need to provide students with knowledge on COVID-19 and promote understanding. The HeLit-Schools concept provides a model of organizational development relatedly to enable sustainable strengthening of health literacy (14).
- O: Emergency Response Measures: This component, highlighting emergency preparedness, supports qualitative findings stressing contingency planning. Its operational architecture emphasizes a systematic cohesion of interdependent components, enabling collaborative action across the spectrum of pandemic response within an integrated and holistic framework (21).
- O: Organizational Practice: Effective School Management: This part about efficient allocation of resources and decision-making is aligned with the qualitative data emphasizing strong management of the school (9).
- L: Legislation: Policy and Guidelines The other component of this model focuses on alignment with relevant policies, which correlates with the qualitative findings that emphasized the need for guidance through policies (21, 30).

5. CONCLUSIONS

The findings from this study demonstrate the importance of including health literacy and institutional preparedness in schools and school systems, particularly during and in the aftermath of pandemics. Hence, the NICS-SCHOOL Model offers a theoretical base for leadership in school administration which is isomorphic to the foci of the present study. It does so by boosting health literacy on pandemics, encouraging students to comply with the rules and increasing collaboration between the

educational and public health systems. The ideas can be implemented into practice at schools by adopting the NICS (New Normal Infection Control and School-based Management) model: N = Needs-based planning, I = Integration of system, C = Communication strategies, S = Sustainability. Therefore, incorporating the NICS model into school policy and training could have build school sustainable readiness for COVID-19 and future pandemics. More research should investigate whether and to what extent such model use influences readiness of institutions, student compliance, and the longer-term health of students.

Consent For Publication: Not applicable

Availability Of Data and Materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests: The authors declare that they have no competing interests

Funding: This research was financially supported by the Health Systems Research Institute (HSRI), Thailand. Additional support was provided by the Excellence Center for Public Health Research, Walailak University, which facilitated academic resources, networking, and technical collaboration essential for this project.

Ethics Approval and Consent to Participate: This research were conducted under the Human Research Ethics Approval, Project Code WU-EC-PU-3-081-64, Document Number WUEC-21-100-01, by the Human Research Ethics Committee, Walailak University, (Assoc. Dr. Chuchard Pansawad) on June 4, 2021, by the project manager, Asst. Prof. Paleeratana Wongrith.

Authors' contribution:
PW; Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing
PT; Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – review & editing
PK; Conceptualization, Methodology, Formal analysis, Supervision, Writing – original draft, Writing – review & editing
PB; Conceptualization, Formal analysis, Investigation, Methodology, Software, Formal analysis,
Writing – original draft, Writing – review & editing
SS; Investigation, Methodology, Writing – original draft, Writing – review & editing

Acknowledgements: The authors express their sincere gratitude to the Health Systems Research Institute (HSRI), Thailand and the Excellence Center for Public Health Research, Walailak University, for providing research facilities and administrative support throughout this study. Appreciation is also extended to the participating schools, teachers, and local public health officers in upper southern Thailand for their collaboration and valuable insights during data collection and program implementation.

REFERENCES

Filip R, Gheorghita Puscaselu R, Anchidin-Norocel L, Dimian M, Savage WK. Global Challenges to Public Health Care Systems during the COVID-19 Pandemic: A Review of Pandemic Measures and Problems. J Pers Med. 2022;12(8).

World Health O. Health systems for health security: a framework for developing capacities for International Health Regulations, and components in health systems and other sectors that work in synergy to meet the demands imposed by health emergencies. Geneva: World Health Organization; 2021 2021.

3Global School Health Initiatives: Achieving Health and Education Outcomes, REPORT OF A MEETING Bangkok, Thailand, 23–25 November 2017 [Internet]. WHO. 2017 [cited 20 October 2022]. Available from: http://apps.who.int/iris/bitstream/handle/10665/259813/WHO-NMH-PND-17.7-eng.pdf;jsessionid=2C38FBBB0C431ABAC999C5D3269B0E1C?sequence=1.

4The Coronavirus situasion in Thailand [Internet]. Emergency Operation Center, Department of Disease Control, Ministry of Public Health. 2021 [cited 1 june 2022]. Available from: (https://ddc.moph.go.th/viralpneumonia/eng/file/situation/situation-no672-111164.pdf).

Payaprom Y, Manasatchakun, P. ., & Chandeekaewsakoon, S. . redictive Power of Health Literacy on COVID-19 Preventive Behaviors of Nursing Students. . PNursing Science Journal of Thailand. 2024;42(4):27–40.

Rapid spread of COVID-19 [Internet]. [Internet]. 2020 [cited Apr 21,2022]. Available from: https://msto.dmsc.moph.go.th/login/showimgdetil.php?id=218.

Considerations for school-related public health measures in the context of COVID-19: annex to considerations in adjusting public health and social measures in the context of COVID-19, [Internet]. WHO. 2020. Available from: (WHO/2019-nCoV/Adjusting_PH_measures/Schools/2020.2).

Pal I, Sukwanchai, K., Bhuridadtpong, A., & Pal, A. . Impacts of pandemic on education sector in Thailand. . Pandemic Risk, Response, and Resilience. 2022:457–69.

Tangcharoensathien V, Vandelaer J, Brown R, Suphanchaimat R, Boonsuk P, Patcharanarumol W. Learning from pandemic responses: Informing a resilient and equitable health system recovery in Thailand. Frontiers in Public Health. 2023;11.

Assessment of health literacy on disease prevention and control and health hazard among Thai people, the year 2021 [Internet]. Nonthaburi: Department of Disease Control. 2021 [cited Nov 20, 2023]. Available from: https://datariskcom-ddc.moph.go.th/download/การประเมินความรอบรู้ด้-6/.

Nutbeam D, McGill B, Premkumar P. Improving health literacy in community populations: a review of progress. Health Promotion International. 2018;33(5):901-11.

Rosenstock IM, Strecher VJ, Becker MH. Social Learning Theory and the Health Belief Model. Health Education Quarterly. 1988;15(2):175-83.

Niu Z, Qin Z, Hu P, Wang T. Health Beliefs, Trust in Media Sources, Health Literacy, and Preventive Behaviors among High-Risk Chinese for COVID-19. Health Commun. 2022;37(8):1004-12.

Kirchhoff S, Dadaczynski K, Pelikan JM, Zelinka-Roitner I, Dietscher C, Bittlingmayer UH, et al. Organizational Health Literacy in Schools: Concept Development for Health-Literate Schools. Int J Environ Res Public Health. 2022;19(14).

Chong YY, Cheng HY, Chan HYL, Chien WT, Wong SYS. COVID-19 pandemic, infodemic and the role of eHealth literacy. International Journal of Nursing Studies. 2020;108:103644.

Leksy K, Gawron G, Rosário R. Associations between Polish school principals' health literacy and implementation of the Health Promoting School approach during the COVID-19 pandemic. PLoS One. 2024;19(4):e0301055.

Spring H. Health literacy and COVID-19. Health Info Libr J. 2020;37(3):171-2.

Global Standards for Health Promoting Schools [Internet]. WHO. 2021 [cited 20 October 2022]. Available from: https://cdn.who.int/media/docs/default-source/health-promoting-schools/global-standards-for-health-promoting-schools-who-unesco.pdf.

Endriyas M, Woldemariam B, Shibru E, Hussen M, Bedru B, Moges M, et al. Readiness of public schools before reopening during COVID-19 pandemic: School-based cross-sectional survey in southern Ethiopia. PLoS One. 2023;18(10):e0293722.

Krishnaratne S, Pfadenhauer LM, Coenen M, Geffert K, Jung-Sievers C, Klinger C, et al. Measures implemented in the school setting to contain the COVID-19 pandemic: a scoping review. Cochrane

Database Syst Rev. 2020;12(12):Cd013812.

Salanguit MB, Santillan MDC, Gregorio ER, Jr., Estrada CAM, Shibuya F, Nishio A, et al. School health policies and their implementation during the COVID-19 pandemic in the Philippines. Trop Med Health. 2024;52(1):98.

Huber SG, Helm C. COVID-19 and schooling: evaluation, assessment and accountability in times of crises—reacting quickly to explore key issues for policy, practice and research with the school barometer. Educational Assessment, Evaluation and Accountability. 2020;32(2):237-70.

Poague K, Blanford JI, Martínez JA, Anthonj C. Preparing schools for future pandemics: Insights on water, sanitation and hygiene solutions from the Brazilian school reopening policies. Int J Hyg Environ Health. 2024;257:114325.

Danaei Mehrabad S, Panahi S, Sedghi S, Aryankhesal A. Information and health literacy policies during pandemics: A narrative review. Health Info Libr J. 2024;41(3):216-34.

Li D, Nyhan K, Zhou X, Zhu Y, Castro D, Vermund SH, et al. School closures and reopenings during the COVID-19 pandemic: a scoping review protocol. BMJ Open. 2022;12(2):e054292.

West HM, Flain L, Davies RM, Shelley B, Edginton OT. Medical student wellbeing during COVID-19: a qualitative study of challenges, coping strategies, and sources of support. BMC Psychol. 2024;12(1):179.

Berg SH, Shortt M, Røislien J, Lungu DA, Thune H, Wiig S. Key topics in pandemic health risk communication: A qualitative study of expert opinions and knowledge. PLOS ONE. 2022;17:e0275316.

Kumalasari K, Sujarwoto S, Sentanu IGEPS. Stakeholder Collaboration: Networking Actor Collaboration in Handling Covid-19 the New Normal Era Indonesia2021.

Poague KIHM, Blanford JI, Martínez JA, Anthonj C. Preparing schools for future pandemics: Insights on water, sanitation and hygiene solutions from the Brazilian school reopening policies. International Journal of Hygiene and Environmental Health. 2024;257:114325.

Benson C, Obasi IC, Akinwande DV, Ile C. The impact of interventions on health, safety and environment in the process industry. Heliyon. 2024;10(1):e23604.