Are Elementary Schools Ready for Disaster Preparedness and Safety?

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Abstract. Many schools are located in high-risk areas. Safety education in Indonesia is limited to disaster education with a risk paradigm. The practice is separated from Child-Friendly School, which protects children from violence. In addition, many contents of safety education have not been provided in school because of many limitations. Therefore the development of Disaster Preparedness and Safety School/*Sekolah Selamat Siaga Bencana* (SSSB) model with a multi-hazard approach is viewed as a strategic move, especially during the current Covid-19 pandemic. The purpose is to determine the indicators that can reflect SSSB measurement tools. This was a descriptive study with a three-stage multi-method approach, starting from a literature review to formulate the constructs and indicators. Subsequently, I used qualitative and quantitative methods combined with the sequential exploratory method. Sampling was conducted by the purposive sampling method. The results show that the measurement tool consists of 7 constructs, 29 indicators, and 80 questions that reflect SSSB: commitment, curriculum, information exposure, infrastructure and facilities, preparedness, monitoring system, empowerment of institutional roles and capacity of school communities. The instrument's content validity as measured by the Content Validity Ratio (CVR) and Content Validity Index (CVI) indicated high content validity. This measuring tool can help schools to increase school resilience from multi-hazard threats.

1 Introduction

Disaster Preparedness and Safety School (SSSB) is essential in Indonesia. SSSB model can integrate a multi-hazard prevention approach such as hazards of violence against children, safety incidents and disasters. This SSSB is a form of safety lock from the school as an education provider to students and all communities involved in the teaching and learning process at school. Therefore, it is necessary to determine the key indicators that can reflect SSSB measurement tools to build a safety education assessment system for school children.

1.1 Disaster and Schools in Indonesia

Indonesia is an archipelago country prone to disaster due to its geographic position, geologic, hydrologic and demographic condition (1). Many natural disasters have occurred in Indonesia, e.g. Indonesia's tsunami was ranked first out of 265 countries in terms of casualty (5,402,239 victims), compared to Japan (4,497,645 victims). Regarding landslides, Indonesia is still leading out of 162 countries in casualties (197,372 victims) compared to India (180,254 victims). In terms of the earthquake, Indonesia is ranked third out of 153 countries regarding the number of affected people (11,056,806 people) (2).

Schools in Indonesia are also at risk for disasters because many are located in disaster-prone areas, and 30% of schools are in an inappropriate state. In 2004, Aceh's earthquake and tsunami destroyed more than 2,000 school buildings. In 2006, Yogyakarta's earthquake destroyed about 2,900 schools. In 2009, an earthquake in West Sumatra affected more than 2,800 schools, with more than 40% seriously damaged, while in the same year, an earthquake in West Java severely damaged 2,091 schools. In 2010, an earthquake and a tsunami in Mentawi destroyed seven schools, and in 2013 an earthquake in Central Aceh and Bener Meriah damaged 514 schools. Education facilities suffer the most significant damage (63%) compared to other facilities (2,3).

Besides facilities, the curriculum is one of the most critical aspects inherent in the education system (4). 60% of subjects in grade 1 elementary school are provided information about safety values, while 14.3%, 90%, 100%, 87.5%, and 50% subjects in grade 2 through 6 respectively are provided safety information (5). As reflected in teaching materials, the implementation of safety education in elementary schools showed that 4 out of 5 points (80%) were substandard (6). Increasing teachers' capacity in education is essential, especially on safety aspects, to overcome the problem of low safety materials. The integration of children safety education subjects in elementary school is urgently needed (5).

Disasters impact physical, psychological, social and economic aspects of individuals, families and communities. The consequences of disasters on children are far more significant than on adults. Disaster preparedness is required by both national and international law; one of the best ways to prepare children's psychosocial readiness is through education on how to act during disaster events (7,8)(7,8).

1.2 The Current Study

Children are in a vulnerable position at school, despite disaster management education becoming a global trend. Through education, the concept of disaster management can be cultivated at an early age to instil the correct understanding of safety education concepts. Injury, death and property damage can be reduced, and school resilience can be improved if schools could practice disaster management comprehensively (multi-hazard-based), especially if they have an assessment software that supports the disaster management in schools which allows structured and systematic self-evaluation (9,10). However, Widowati et al. (2019) conducted a systematic review through electronic databases could not find any mobile health applications (app) that assess multi-hazard-based child safety education in schools. Therefore, it is necessary to develop a safety education assessment tool in schools that can later be improved into a mobile health application assessment tool (11).

Why is the SSSB assessment tool necessary? An assessment instrument is necessary to support systematic evaluation of the safety aspect in education for a more efficient and effective result. The safety assessment tool will help the assessor systematically evaluate

the detail from general to specific matters and provide understandable and reliable feedback. Several features are also needed to develop a complete and independent safety evaluation system that can measure safety aspects, especially in a practical manner (12,13). SSSB has strategic internal benefits such as increasing school resilience from a multi-hazard aspect and external benefits such as improving its appeal and public trust. This is in line with what is mandated in the action plan for disaster safe school/madrasah roadmap (2).

2 Method

2.1 Research Design

This study used a descriptive research design through a three-stage multi-method. The first stage began with a literature review to formulate the constructs and indicators from various standard safety assessment systems sources in schools. The next step was a qualitative and quantitative study with mixed exploratory sequential methods. In this second stage, we qualitatively sought advice regarding collection and data analysis from the expert team on drafted constructs and indicators through the previous literature review. In the third stage, the expert team collected and analyzed data quantitatively by assessing the constructs and indicators that were previously suggested for the SSSB tool.

2.2 Data Analysis

Quantitative analysis was performed through Content Validity Ratio (CVR) and Content Validity Index (CVI) values to assess content validity from the expert test. Each item was divided into three answer choices: 1=important, 2=useful but not essential, and 3=not required. If more than half of the panellists consider the item necessary, it had good content validity. The Lawshe formula is as follows:

$$CVR = \frac{\{ne - \frac{N}{2}\}}{N/2}$$

(1)

Note: ne = sum of panelist (expert) that chose "important"; N = sum of panelist (expert).

This formula will produce values that range from +1 to -1. Positive values indicate that at least half of the panelists considered the item as important. More positive CVR value indicates its higher "importance" and its content validity. In addition, this study also measured whether each item in the scale is appropriate or relevant to the construct or not through CVI. Each item was divided into four choices of assessment answers, 1=not relevant, 2=slightly relevant, 3=fairly relevant, 4=very relevant. For each item, the CVI was calculated as the sum good ratings given by experts (3 and 4) to obtain a dichotomized ordinal scale, relevant = 1 (for values of 3 or 4) and irrelevant = 0 (for values of 1 or 2) divided by the total number of experts. The CVI value according to Lynn (1986) should not be lower than 0.78 (14).

2.3 Participants

The participants were 9 experts (including the social workers) from international and local level organizations/institutions. The sampling technique used in this study was purposive sampling. The 9 experts involved included 4 key expertise, namely disaster education, safety education, child protection, and elementary education. The mapping of experts and their competencies are shown in Table 1.

Table 1. Expert Composition.

Organization Level	Institution Name	Institution Type	Expertise
International*	UNICEF	NGO	Protection of child from violence
	WHO	NGO	Children's health is an emergency
	ILO	NGO	Safety education and culture
Province**	Disaster Management (DM 1) Agency	Government	Disaster management (including disaster mitigation and disaster education)
	Child Protection/CP Agency	Government	Child protection and fulfillment of children's rights
	Red Cross Indonesia (RCI)	NGO	Disaster management (including at school)
District/City**	Disaster Management (DM 2) Agency	Government	Disaster management (including disaster mitigation and disaster education)
	Departement of Education (DE)	Government	Elementary school education.
	Elementary School (ES)	School	Elementary school education.

* International level Organization
** Local level institution/Organization

2.4 Research Ethics

Researchers followed procedures related to research ethics, especially those relating to the protection of research subjects using the Research Respondent Information Sheet, Ethical Clearance and Informed Consent. This research protocol was approved by the Medical and Health Research Ethics Committee..

3 Results

3.1 Overview Results of Constructs and SSSB Indicators Development

There were 15 references used to prepare SSSB indicators and assessment instruments, 5 (33%) international sources and 10 (67%) Indonesian sources. Indonesian standards are more widely used to emphasize items that the items presented would be

mandatory for Indonesian schools. The references for developing constructs and indicators were based on the literature review, as detailed in Table 2.

Construct	Reference Standard Number used	Weightage (1 to 3)	Total Items	Composition (%)
School commitment	1, 2, 3*, 4*, 6, 7, 8, 9, 10, 11*, 12*, 13, 14, 15*	3	21	28
Formal education curriculum	1, 2, 3*, 4*, 5, 6, 7, 8, 9, 10, 11*, 13, 14	3	10	14
Information exposure	1, 2, 3*, 4*, 5, 6, 7, 8, 9, 10, 11*, 12*, 14, 15*	3	6	8
School infrastructure and facilities	1, 2, 3*, 4*, 5, 6, 7, 9, 10, 11*, 12*, 13, 14, 15*	2	17	15
Preparedness	1, 2, 3*, 4*, 6, 7, 8, 9, 10, 11*, 12*, 13, 14, 15*	3	15	20
Monitoring system	1, 2, 3*, 5, 6, 7, 10, 11*	3	7	10
Empowerment of institutional roles and capability of school communities	1, 2, 3*, 5, 6, 7, 8, 11*, 13, 14, 15*	3	4	5
	Total:		80	100

Table 2. Construct Mapping.

Note.—* International References

Number description: 1) Law of the Republic of Indonesia Number 24 in 2007 on Disaster Management, 2) Law of the Republic of Indonesia Number 35 in 2014 on Child Protection, 3) Hyogo Framework for Action 2005-2015, 4) Sendai Framework for Disaster Risk Reduction 2015-2030, 5) Mainstreaming Strategy for Disaster Risk Reduction in Schools, 6) Module 1 on Safe School Facilities, 7) Module 2 on Disaster Management in Schools, 8) Module 3 on Risk Reduction Education, 9) Disaster Preparedness School Framework, 10) Guidelines for Implementation of Schools/Madrasah Safe from Disasters, 11) Safety School (SS), 12) FRESH (Focusing Resources on Effective School Health), 13) Child-Friendly School Guidelines (Ministry of Women Empowerment and Child Protection), 14) Guidance for Monitoring and Evaluation of Disaster Preparedness Schools (LIPI/Indonesian Institute of Sciences), and 15) CDC School Health Index.

This measurement tool consists of 7 constructs, 29 indicators and 80 reflective question items. The constructs that reflect SSSB are School Commitment/SC (consists of 6 indicators and 21 question items), Formal Education Curriculum/FC (5 indicators and ten items), Information Exposure/IE (2 indicators and six items), School Infrastructure and Facilities/SIF (4 indicators and 17 items), Preparedness/P (7 indicators and 15 items), Monitoring System/MS (3 indicators and seven items), Empowerment of Institutional Role and Capability of School Communities/ESC (2 indicators and four items).

The 29 indicators that reflect SSSB are policy, planning, budgeting, reporting, taskforce, Disaster Risk Reduction (DRR) programs, teaching materials, laboratory guides or modules, learning instructions, evaluation tools, extracurricular activities, availability of information related to DRR, DRR knowledge of the school community, school buildings, communication and information facilities for DRR and early warning, facilities for learning and playing environment, evacuation facilities, response SOP (Standard Operational Procedures), referral SOP, evacuation SOP, reunification SOP, training, simulations, risk assessments, self-assessments, participatory monitoring & evaluation, charts and mechanisms for suggestions and complaints, partnerships, and partnership mechanisms.

School commitment is an agreement to conduct specific actions voluntarily or by force. Commitments in the SSSB concept consists of six indicators policies, planning, budgeting, reporting, task forces, and DRR programs/activities. Indicators in School Commitments were measured through the results of document study, with an ordinal scale from 1 to 4, from "unavailable" to "fully available and implemented".

The formal education curriculum is a set of plans and arrangements regarding the objectives, content, learning materials and methods used as a guideline to organize formal learning activities to achieve specific educational goals (*Law of Indonesia Republic Number 20 in 2003 concerning the National Education System*, 2003), which includes activities done both intra and extracurricular. Indicators in the curriculum were measured through the results of the document study (availability of documents of intra-curricular and extracurricular activities), with an ordinal scale from 1 to 4, from "unavailable" to "available and fully implemented".

Information exposure is the availability and provision of information done intentionally to provide adequate knowledge on safety education through various media which targets not only children or students but also school principals, teachers, staff, parents, extracurricular supervisors, security staff, cleaning service and school guards. Information exposure indicator was measured through document study, observation and interview, with an ordinal scale from 1 to 4, from "unavailable" sufficient information/knowledge to "adequate" information/knowledge on child safety.

School facilities and infrastructure are the primary physical support to meet educational needs according to the student's physical, intellectual, social, emotional and mental growth potential. This factor was measured in 4 indicators, namely: school building indicator (composed of the classroom, rooms to support learning activities, laboratory), communication and information facility for DRR and early warning, learning environment facilities and playground (includes: school gates, stairs, functional fire protection system [at least have fire extinguisher], playground, CCTV, indoor and outdoor APE, and safety zone signs at school), evacuation facilities (includes: evacuation map, evacuation sign and gathering point). School Infrastructure and Facilities indicator was measured according to observation result using an ordinal scale from 1 to 4, ranging from "unavailable" to "available and every facility met child safety standard".

Preparedness is an effort to anticipate disaster by organizing appropriate and meaningful steps (*Law of Indonesian Republic Number 24 the Year 2007 about Disaster Management*, 2007). This factor was measured through seven indicators, namely: response SOP availability, referral SOP, evacuation SOP, reunification SOP, training to anticipate disaster risk, simulation and risk assessment. Preparedness indicator was measured through document study result, in an ordinal scale from 1 to 4, ranging from "unavailable" to "available and completely implemented/simulated".

The monitoring system is monitoring and evaluating activities, both internally and participative, towards improving school quality. Indicators in the monitoring system were measured through document study using an ordinal scale from 1 to 4, which ranges from "unavailable" to "available and working optimally".

Empowerment of institutional roles and capability of school communities is the active participation of independent institutions and social workers to improve child safety education. Indicators for empowerment construct was measured through document study using anmordinal scale from 1 to 4, which ranges from" unavailable" to "available and optimal and involved most of the available communities". This measuring tool contains 80 reflective questions to realize SSSB. The content scheme of SSSB items is shown in Figure. 1.

3.2 Weightage Scheme and Item Score

Weightage in this measurement tool was obtained from a consensus on average weightage given as shown in Table 2. Expert weightage range begins at score 1 to 3, and the result showed that all experts gave a weightage of 3 to 6 out of 7 constructs, except infrastructure, so that this instrument would not demotivate small schools and schools in remote areas to implement other indicators because the infrastructure indicator is costly to implement fully.

Scores in the SSSB measurement tool result from additions to scores in the ordinal scales (1 to 4) chosen by experts as their answer and multiplied by the weightage of the construct. A score of 1 shows a negative answer, and the answer becomes more positive as the score increases toward 4. Each question represents an item in an indicator. A proportional comparison of items can be made by following comparison between indicator items in every aspect. If experts stated that a particular construct has a more considerable weightage, such weightage would be multiplied with a certain constant according to the recommendations and expert judgement (16).

3.3 Calculation Model and Determination of School Status using SSSB Measurement Tool

Calculation using this measurement tool used 2 index calculations, namely composite and aggregate index. Composite index is an index obtained from index score per construct. Index score ranged from 0–100. Calculation of Composite Index (CI) per construct and Aggregate Index (AI) of SSSB are presented with the following formula.

$$\text{Construct Composite Index } (Y) = \frac{\text{Sum of Real Question Score } (Y) \text{ X weightage}}{\text{Construct Maximal Score } (Y)} \text{ X } 100 \qquad (2)$$

The SSSB aggregate index calculation is as follows.

$$\text{SSSB Aggregate Index} = \frac{\text{Construct } CI \ \{SC+FC+IE+SIF+P+MS+ESC\}}{CI \text{ Maximal Score } \{700\}} \text{ X } 100 \qquad (3)$$

Nine experts (100%) stated that both SSSB index calculation formulas are appropriate for this measurement tool because they are simple and therefore easy to use for the instrument's target respondents in Indonesia. Categorization of achievement index in SSSB used categorization of Disaster Preparedness School Evaluation index score developed by LIPI to prevent any double standard in determination of school's status in Indonesia, (Index score < 55.00 = Low; 55.00-79.49 = Medium; 79.50-100.00 = High) (17).

3.4 Illustration of SSSB Measurement Tool Validation

Lawshe's CVR and CVI represented a validation of the SSSB measurement tool through expert evaluation. Content validation in this study was measured using CVR to measure the agreement between experts on certain items. There were 56 out of 80 items (70%) that obtained CVR score 1 and 24 items (30%) that obtained a CVR score of 0.8. CVR result showed that all items (100%) were considered "important" points and had high content validation. Points that obtained a CVR of 0.8 were the following items: availability of policy, budget, DRR team, multi-disaster-based curriculum, evaluation sheet of students, extracurricular, and infrastructure items (classroom student activity rooms, laboratory, communication facility and information media, stairs, fire protection system, CCTV and evacuation sign).

This study also measured content validity to determine whether every item in the scale was already appropriate or relevant to the construct through CVI. All CVI scores in this study were above 0.78 and therefore had good validity. There were 71 items (88.75%) that obtained CVI score 1 and 9 items (11.25%) that obtained a CVI score of 0.9. Points that obtained a CVI of 0.9 were the following items: availability of multi-disaster-based curriculum and infrastructure items (classroom, learning activity supporting room, laboratory, communication and information facility, fire protection system and evacuation sign).

3.5 Description of Measurement Tool's Benefit

All experts stated that this instrument is appropriate to be used. They also agreed that this instrument is very beneficial for schools and education authorities to be used as a guideline and self-evaluation to realize SSSB. In agreement with experts' opinion, UNICEF (social worker) stated that,

"Logically schools should be grateful. They really need this measurement tool and implementation of this measurement tool is part of school development and so every headmaster should have such vision" (UNICEF, Indonesia).

4 Discussion

There is a need for efficiency measures in schools to assess the impact of a school-based intervention (18). Evidence-based assessment requires proper measuring tools, which are essential components for improving student behaviour (19). The SSSB model is different from the three-factor model for school climate developed by the U.S. Department of Education, which consists of safety, engagement, and the environment (20).

4.1 Are Schools responsible?

Schools are responsible for teaching disaster management and must be able to serve as a shelter due to the high school population and perform evacuation procedures because disaster could happen anywhere and anytime, even in school during school hours. Therefore, schools must perform a risk assessment for possible disasters and how to respond appropriately. If schools can implement a multi-disaster-based risk management approach comprehensively, property damage can be effectively reduced, and schools' resilience toward disaster can be improved (9,21).

The primary responsibility to mitigate disaster lies on the government. However, parts of the responsibility are shared by stakeholders, social workers, parents (22), students and emergency management practitioners to improve schools' resilience. Schools' involvement

in preparedness activities in a larger scale emergency, web-based technology utilization for teacher training, collaborative teaching, integration of disaster preparedness message into students' activities, incorporate preparedness message as a curriculum prerequisite and addition of voluntary activities as one of the national strategies to integrate disaster education curriculum strategically. The school can develop safety messages through interactive illustration media, quizzes, games, and arts to enhance children's understanding. (23–29).

Educators often face obstacles in dealing with child abuse because of the uncertainty of school reporting policies and procedures (30). School-based emergency procedures and continuous evaluation system are needed using appropriate indicators to ensure the consistency of preparedness effort in every school, which is hoped to improve community resilience holistically and improve public safety (Aronsson-Storrier & da Costa, 2017; Ghafory-Ashtiany & Parsizadeh, 2010; Johnston, Tipler, Tarrant, & Tuffin, 2016; R. Ronan, Peace, M. Johnston, & A. Johnson, 2014; Tipler, Tarrant, Johnston, & Tuffin, 2017). Including cases of hate speech at school, hate speech is not an easy problem to overcome at school; guidelines and practical instructions can help teachers contribute together with their students to overcome them (36). This has been proven in Taiwan, where an average of 958 student deaths annually has plummeted due to effective disaster prevention education in school. Therefore, risk assessments for school vulnerability are essential to implement (37).

The teacher training indicator was one of the critical indicators in this study because the lack of awareness towards available resources and the need for teacher training is the most significant impediments in optimal utilization of available resources (32). In addition, SOP must also be available and completed because many schools might still be unprepared to respond to disaster in the future, especially if such response requires family reunification, which is the most important procedure and social workers involved in disaster management (31,35). On the other hand, most samples realized that schools' infrastructure and facilities play an essential role in children's safety. However, it was given a lower weightage compared to other constructs in this study. Therefore, it is not surprising that many schools build infrastructure and facilities according to child safety standards (6).

4.2 Is SSSB Really Important?

SSSB is necessary to be implemented, especially for schools in Indonesia, because SSSB can integrate child-friendly schools, safe schools, and disaster preparedness schools that are still dominated by the risk paradigm and run separately. SSSB index analysis was performed to evaluate the school's achievements in implementing safety and disaster preparedness indicators at the schools to deal with multiple disasters. Multi-disaster approach is a model with a more comprehensive and integrative key indicators development but more straightforward presentation. Child safety education evaluation results can be used to evaluate a school's implementation on child safety from disaster, safety and child violence prevention. School management was chosen as the first step because school management is a form of teamwork, and teamwork assessment is critical (26). Further research to be conducted is to develop indicators on aspects of teachers and students. Evaluation of teacher contributions is very needed to increase the teacher's contribution positively (26). The patterns of student literacy growth vary greatly (38). Therefore an evaluation of student participation also needs to be done in the next step.

5 Conclusions

The SSSB measurement tool developed in this study consists of 7 constructs, 29 indicators and 80 reflective question items. The constructs that reflect SSSB are school commitment, formal education curriculum, information exposure, school infrastructure and facilities, preparedness, monitoring system, empowerment of institutional role and capability of school communities. The result of content validation calculation through CVR and CVI scores showed that both measurement tools have high content validation.

6 Declaration of Conflicting Interests

The researcher stated that there is no potential conflict of interest regarding the research and/or publication of this article.

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Figure 1. Disaster Preparedness and Safety School/SSSB indicator map

Disaster Preparedness and Safety School/SSSB

School commitment

Policy
1. Policy
2. Planning
3. Budgeting
4. Reporting
5. Team
6. DRR Activities

DRR Activities
1. Vision mission on safety education, disaster and violence prevention*
2. Rules*
3. Planning*
4. Budgeting*
5. Reporting*
6. Taskforce
7. Taskforce Decree
8. Taskforce job description
9. Activity programs*

Formal education curriculum
1. Teaching material
2. Lab manual
3. Learning instruction
4. Evaluation tool
5. Extracurricular

Curriculum
1. Curriculum
2. Teaching materials*
3. Lab manual
4. Learning instruction
5. Student evaluation tools*
6. Extracurricular

Information exposure
1. DRR information
2. DRR knowledge

Information
1. Information exposure*
2. Knowledge*

School infrastructure and facilities
1. School building
2. Communication and information facilities
3. Learning environment and playground
4. Evaluation facility

School facility
1. Classroom
2. Supporting rooms
3. Laboratory
4. Communication information system*
5. School gates
6. Stairs
7. Fire extinguisher
8. Playground
9. CCTV
10. Educational teaching aids
11. School safety zone
12. Evacuation map
13. Evacuation signs
14. Gathering point

Preparedness
1. Response SOP
2. Referral SOP
3. Evacuation SOP
4. Reunification SOP
5. Training
6. Simulation
7. Risk Assessment

1. Response SOP*
2. Referral SOP*
3. Evacuation SOP
4. Reunification SOP*
5. Training*
6. Emergency response simulation
7. Risk assessment

Monitoring system
1. Internal
2. External

1. Scheme and mechanism of suggestion and feedback
2. Participative monitoring and evaluation*
3. Scheme and mechanism of suggestion and feedback

1. Internal monitoring and evaluation*
2. Participative monitoring and evaluation*
3. Scheme and mechanism of suggestion and feedback

Empowerment of institutional roles and capabilities of school communities
1. Partnership
2. Partnership mechanism

1. Safety education partnership
2. Disaster education partnership
3. Violence prevention partnership
4. Partnership mechanism availability

Note — * including the fields of safety education, disaster and violence prevention.