UNIVERSITI PUTRA MALAYSIA

RISK ASSESSMENT, OCCUPATIONAL SAFETY IMPLEMENTATION AND PRACTICES WITH AN INTERVENTION OF SAFETY SIGNS AND LINES FOR PRIMARY SCHOOL PUPILS IN LMS DISTRICT, PERAK

MURUGAN SUBRAMANIAMN

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By

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Faculty : Medicine and Health Sciences

The objective of this study were to assess the risk of school safety, evaluate occupational safety implementation and practices in schools and to intervene newly modified safety signage and safety lines for the intervention and control group among the primary school pupils in Larut, Matang and Selama district, Perak state, Malaysia.

This study was carried out into three phases. The first phase is risk assessment with the aim to identify hazards and calculate risk rating (RR). The second phase is to evaluate occupational safety practices and implementation in primary schools. The third phase which is to intervene newly modified safety signs and lines by testing selected primary school pupils knowledge. 110 schools in LMS district was assessed using risk assessment form. Risk Matrix Table was used to categorize the schools either in low, moderate or high risk based on hazards. For the second phase, 102 (91.9%) schools safety coordinator's were questioned about the implementation of occupational safety and practices in their school. In the third phase of study, newly modified safety signages were designed by modifying current safety signage according to MS2558:2014 standard. All the signages was modified with drawn pictures and texts according to identified hazards from the risk assessment. Cluster sampling and randomization procedures was used in selection of school for intervention. The intervention of newly modified safety siganges and lines was done in a school which scored highest RR value from 110 schools (intervention group). Pre-test, post-test and post-test 2 (after 3 months for intervention school only) was done among 303 pupils from intervention group and compared with 465 pupils from control group to test their knowledge on newly modified safety signages and lines. All the data was analyzed using SPSS version 25. The analysis shows that only one school was in high risk (RR 16), 93.6% of schools in medium risk (RR5 - RR9) and 5.5% in low risk (RR4). 82.7% schools have improper grates for drains (RR 12), 93.6% of schools did not fence their septic tank area (RR 12) and all the schools have uneven corridor floor with patches, trip and slope (RR 16). Safety coordinators knowledge on occupational safety

legislation (75.5%) were poor. Safety programmes only focused on fire safety drill. Intervention for all the newly modified safety signs and lines showed significant different between pre-test, post-test and post-test 2 for intervention group ($p < 0.001$) and pupils were able to sustain the meaning of safety signage and lines after three months' time. For the control group, 15 out of 25 safety signages and lines, shows not significant different with $p > 0.05$ between pre-test and post-test. Mean rank different on safety signages and safety lines knowledge scores between intervention and control group was significant ($p<0.05$).

Majority of the schools in LMS district are in medium risk. Implementation and practices of occupational safety in all the primary schools are still lacking and have to be improved. The newly modified safety signages and lines able to promote safety knowledge and can prevent injuries effectively in future.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah.

PENILAIAN RISIKO, PELAKSANAAN DAN AMALAN KESELAMATAN PEKERJAAN DENGAN INTERVENSI TANDA DAN GARIS KESELAMATAN UNTUK MURID-MURID SEKOLAH RENDAH DI DAERAH LMS, PERAK

Oleh

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Objektif kajian adalah untuk menilai risiko keselamatan sekolah, menilai pelaksanaan keselamatan pekerjaan dan amalan di sekolah serta intervensi papan tanda dan garis keselamatan yang telah diubahsuai bagi kumpulan intervensi dan kawalan di kalangan murid-murid sekolah rendah di daerah Larut, Matang and Selama, negeri Perak, Malaysia.

Kajian ini telah dijalankan dalam tiga fasa iaitu dalam fasa pertama penilaian risiko untuk mengenalpasti hazad dan mengira kadar risiko (RR value) dilakukan, pada fasa kedua untuk menilai implimentasi keselamatan pekerjaan dan amalan di sekolah rendah manakala fasa ketiga untuk membuat intervensi papan tanda dan garisan keselamatan yang telah baru diubahsuai dengan menguji pengetahuan murid-murid di sekolah terpilih. Penilaian risiko telah dibuat di 110 buah sekolah di daerah LMS dengan menggunakan borang berpandukan Ewart (2009) dan DOSH (2008). Jadual matrik risiko digunakan untuk mengkategorikan sekolah-sekolah berisiko rendah, sederhana atau tinggi. Untuk kajian fasa kedua, 102 (91.9%) penyelaras keselamatan sekolah telah mengisi borang soal selidik implimentasi amalan keselamatan pekerjaan. Manakala untuk fasa ketiga, intervensi papan tanda dan garisan keselamatan telah dijalankan disekolah yang terpilih. Papan tanda keselamatan telah direka cipta berpandukan standard MS2558:2014 dan telah ditambah gambar dan teks berpandukan hazad yang telah dikenalpasti melalui penilaian risiko. Pemilihan sekolah untuk intervensi telah dilakukan melalui kaedah kluster sampel dan prosedur rawakan. Penilaian intervensi papan tanda keselamatan dan garisan keselamatan telah dijalankan di sekolah yang mempunyai nilai RR paling tinggi daripada 110 buah sekolah. Ujian pra, ujian pasca 1 dan ujian pasca 2 (dijalankan selepas 3 bulan untuk sekolah intervensi sahaja) telah dijalankan di kalangan 303 murid dari kumpulan intervensi dan dibandingkan dengan 465 murid dari kumpulan kawalan untuk menguji pengetahuan

mereka tentang papan tanda keselamatan dan garisan keselamatan yang baru diubahsuai. Semua data dianalisis menggunakan perisian SPSS versi 25.

Data analisis menunjukkan hanya satu sekolah berada dalam kategori berisiko tinggi (RR16), 93.6% sekolah dalam kategori berisiko sederhana (RR5-RR9) dan 5.5% dalam kategori risiko rendah (RR4). 82.7% sekolah tidak mempunyai penutup longkang besi yang sesuai (RR 12), 93.6% sekolah tidak memagar kawasan tangki najis (RR 12) dan semua sekolah mempunyai lantai koridor yang tidak rata berlubang, sadung dan cerun (RR 16). Pengetahuan perundangan tentang keselamatan pekerjaan adalah sangat lemah (75.5%) di kalangan penyelaras keselamatan sekolah. Program keselamatan di sekolah hanya berfokus kepada kawad kebakaran sahaja. Intervensi papan tanda dan garisan keselamatan yang baru diubahsuai menunjukkan perbezaan yang signifikan diantara ujian pra, ujian pasca 1 dan ujian pasca 2 bagi kumpulan intervensi ($p < 0.001$) dan mereka juga masih boleh ingat maksud papan tanda dan garisan keselamatan selepas tiga bulan. Bagi kumpulan kawalan, 15 daripada 25 papan tanda keselamatan dan garisan keselamatan menunjukkan perbezaan tidak signifikan dengan nilai $p > 0.05$ antara ujian pra dan ujian pasca. Perbezaan kedudukan min skor pengetahuan papan keselamatan dan garisan keselamatan diantara kumpulan intervensi dan kawalan menunjukkan keputusan yang signifikan ($p < 0.05$).

Kebanyakkan sekolah di daerah LMS berada dalam kategori berisiko sederhana. Implementasi dan amalan keselamatan pekerjaan di sekolah masih serba kekurangan dan perlu diperbaiki. Papan tanda keselamatan dan garisan keselamatan yang baru diubahsuai dapat mempromosikan pengetahuan keselamatan dan dapat mencegah kecederaan dengan berkesan pada masa akan datang.

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I certify that a Thesis Examination Committee has met on (date of viva voce 10 December 2020) to conduct the final examination of Murugan Subramaniam on his thesis entitled "Risk assessment, occupational safety implementation and practices with intervention of safety signs and lines primary school pupils in LMS district, Perak." in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the degree of Doctor of Philosophy.

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LIST OF ABBREVIATIONS

APOSHO	Asia Pacific Occupational Safety and Health Organization (www.ifap.asn.au/)
ASTI	Association of Secondary Teachers in Ireland (website http://www.asti.ie)
BS	British Standard
DOSH	Department of Occupational Safety and Health
HIRARC	Hazard Identification, Risk Assessment and Risk Control
ISO	International Standard Organization
LMS	Larut, Matang and Selama (district name in Perak state)
MOE	Ministry of Education, Malaysia
MS	Malaysian Standard
NIOSH	National Institute of Occupational Safety and Health
NSKC	National Safe Kids Campaign
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act, 1994 (Malaysia)
OHSAS	Occupational Health and Safety Management System
OSHA US	Occupational Safety and Health Administration of United States
PE	Physical education (school subject)
PKS	Piawaian Keselamatan Sekolah
RoSPA	Royal Society for the Prevention of Accidents
RR	Risk Rating value
MS	Malaysian Standards
UBBL	Uniform Building By Law
UPM	Universiti Putra Malaysia
WHO	World Health Organization

GLOSSARY OF TERMS

Accident

An accident can be described as an unplanned, undesirable, unexpected and uncontrolled event. An accident does not necessarily result in an injury. It can be in term of damage to equipment and materials and especially those that result in injuries receive the greatest attention (Heinze, 1997).

AccepTable risk

Risk that is regarded as insignificant either as it stands, or as a result of risk controls (School of the Built Environment, 2013).

Caution

Caution is a signal word used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury (MS2558, 2014).

Danger

Danger is a signal word used to indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury (MS2558, 2014).

Fire safety signs

Signs advising the location of fire alarms and fire-fighting facilities (MS2558, 2014).

General warning sign

A general warning sign is a safety sign used to signify a general hazard. While a warning sign means safety sign that indicate a specific source of potential harm (ISO17724, 2003).

Harm

Harm can be defined as injury or damage to health of people, or damage to property or the environment (ISO/IEC Guide 51:2014(E)).

Hazard

Hazard is a source of potential harm (ISO/IEC Guide 51:2014(E)). The term hazard is generally qualified in order to define its origin or the nature of the expected harm (e.g. electric shock hazard, crushing hazard, cutting hazard, toxic hazard, fire hazard, drowning hazard). A source or a situation with a potential for harm in terms of human injury or ill health, damage to property, damage to the environment or a combination of these (DOSH HIRARC, 2008).

Colling (1994) define hazard as a source or a situation with a potential for harm in terms of human injury or ill health, damage to property, damage to the environment or a combination of these.

Hazard identification means the identification of undesired events that lead to the materialization of the hazard and the mechanism by which those undesired events could occur (Colling, 1994).

HIRARC

HIRARC is an abbreviation for ***Hazard Identification, Risk Assessment and Risk Control.*** With HIRARC, one wasable to identify hazard, analyze and assess its associated risk and then apply the suitable control measures (Colling, 1994).

Incident

Work-related event(s) in which an injury or ill-health (regardless of severity) or fatality or damage to property or could have occurred;

NOTES:

1: An accident is an incident which has given rise to injury, ill health or fatality.

2: An incident where no injury, ill health or fatality occurs may also be referred to as a "near-miss", "near hit", "close-call" or "dangerous occurrence".

3: An emergency situation is a particular type of incident.

(OSH Management, DOSH, 2011)

Injury

An injury is defined as "the physical damage that results when a human body is suddenly subjected to energy in amounts that exceed the threshold of physiological tolerance – or else the result of a lack of one or more vital elements, such as oxygen" . The energy in question can be mechanical, thermal, chemical or radiated (Peden et al., 2008).

Prohibition signs

Signs indicating an action or activity are not permitted (MS2558, 2014).

Pupil

Malaysian Education Act 1996 (Act 550) Section 2, interpreted pupil as "a person of any age for whom education or training is being provided in an education institution". With that, in this study the terms pupil will represent primary school students from

standard one to standard six or students who is schooling from age seven to twelve years old.

Mandatory action signs

Signs indicating an instruction shall be carried out (MS2558, 2014).

Risk

Risk is a combination of the probability of occurrence of harm and the severity of that harm (ISO/IEC Guide 51:2014(E)).
Risk means a combination of the **likelihood of an occurrence** of a hazardous event with specified period or in specified circumstances and the severity of injury or damage to the health of people, property, environment or any combination of these caused by the event (HIRARC, DOSH HIRARC, 2008).

Risk assessment

Risk assessment means the process of **evaluating** the risks to safety and health arising from hazards at work (DOSH HIRARC, 2008).

The process of estimating and evaluating the risk(s) arising from a hazard(s), taking into account the adequacy of any existing controls, and deciding whether or not the risk(s) is accepTable (MS1722:2011).

Clause 4.3.1 in OHSAS 18001:2007 define risk assessment as a process of **evaluating** the risk to safety and health arising from hazards at work.

School Injuries

A school injury is an injury that occurred during educational activities at school, voluntary activities organized by the school, practices and activities the student has done on the command or with the permission of the teacher or another entrusted school employee (Turekuva et al., 2016)

Safe condition signs

Signs indicating an evacuation route, the location of safety equipment or a safety facility, or a safety action (safe condition signs) (MS2558, 2014).

Safety hazards

A safety hazard is any force strong enough to cause injury, or damage to property (DOSH HIRARC, 2008).

Safety marking

Safety marking is a marking which adopts the use of safety colours and safety contrast colours to convey a safety message or render an object or location conspicuous (ISO 3864-1:2011).

Safety sign

Sign which gives a general safety message, obtained by a combination of a colour and geometric shape and which, by the addition of a graphical symbol, gives a particular safety message (MS2558, 2014).

Safety symbol

Visually perceptible Figure with a particular meaning used to transmit information independently of language (MS2558, 2014).

Supplementary sign

Sign that is supportive of a safety sign and the main purpose of which is to provide additional clarification.

Tolerable risk

Risk at a level that can be accepted provided risk controls are implemented to reduce risk as low as is reasonably practicable, i.e. reduced to a point where it can be shown that the costs (in terms of time, money and/or effort) of further risk reduction would be disproportionate to the further benefits (School of the Built Environment, 2013).

Warning signs

Signs warning of a hazard or hazardous condition (MS2558, 2014).
Warning is a signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury (ISO/IEC Guide 51:2014(E)).

Unsafe Act

Unsafe act is unaccepted practices which have the potential for producing future accidents and injuries (Aksorn et al, 2007).
Stranks (2000) define unsafe act as "…any act that deviates from generally recognized safe way of doing a job and increases the likelihood of an accident…"

Unsafe condition

A condition in the work place that is likely to cause property damage or injury. Some examples are inadequate warning systems, congestion, poor housekeeping, inadequate supports or guards (Stranks, 2000).

CHAPTER 1

INTRODUCTION

1.1 Introduction

Safety plays an important role in our daily life. We do every activity in our daily life carefully to avoid any injuries, diseases or stress. The children at home are taken care by their parents and they teach them to do any activities safely. Meanwhile when they are in the schools, the school management is fully responsible regarding their safety. To ensure their health and safety, Ministry of Education came out with school act and regulation, school safety guidelines or manuals and circulars from time to time (MOE, 2015).

Nowadays, safety and health issues in schools captured attention from many peoples. Recently local newspapers and electronic devices reported several incidents and accidents in the schools which caused physical injuries and even death. This shows that they are something still lacking in management of school safety control and prevention. Responsibilities for safety and health by Ministry of Education had to be refocused (MOE, 2015).

Peden (World Report on Child Injury Prevention, 2008)) reported nearly 40% of main cause of death among children (age 1-14 years old) caused by injuries. More than 2000 families were affected daily around the world by the loss of a child due to unintentional injury or accident. Unintentional injuries are the biggest problem once the children reach five years old and the major cause of disabilities.

With the number of Malaysian population increasing year by year, the number of children's also increased. There are 2,814,681 children are studying in 7,733 primary schools in Malaysia for January 2013 (MOE, 2013). They are spending almost seven hours in schools. So, the possibility of intentional or unintentional injuries to occur is very high. This supported by the Third National Health and Mobidity Survey (NHMS III) (2006) findings that incident rate for injuries at 900 schools were 7.0 (CL: 6.5-7.5). Incident rate for age group 15 to 17 years (upper secondary school) was 8.5 higher compared to age group 7 to 14 years, which was 6.6. Their survey also indicate that unintentional injuries or accident contributed 79.8% of all type of injuries in school. Most of absentees to school caused by injuries and they miss their lesson due to it (John T.A. et al, 1994). Just in three months period of time, a total of 1,846 school injuries with six deaths were reported at government hospitals and clinics in Malaysia (Junainah et al., 2002).

In Malaysia, there are number of incidents highlighted by the media on school children incidents which caused injuries and deaths. For example there are two cases recorded at Selangor in year 2011whereby two students from year one injured when the school flag

pole fall suddenly on them during school sports day and an eleven years old boy died when the goal post fall on him during football games; there are cases where two school children death and another injured due to lightning strike while playing in the school field in year 2012 at Kuala Kangsar, Perak (MOE, 2013).

Ministry of Education (MOE) Malaysia had given concern on safety issues in schools. Therefore they came out with Education Act, 1996 which also focused on safety aspect in schools. Furthermore, few circulars also were directed to schools to ensure health and safety of primary and secondary school students during physical educations activities (MOE Circular 1/1995, MOE Circular 6/1998) and children disciplines (MOE Circular 7/2011). MOE also given guidelines in management of children safety at school in MOE Circular 8/2011 which emphasis roles of School Parent and Teacher Society to increase student's safety. A part of that, School Concept and Safety Manual (2002) was implemented for the sake of student's safety.

1.2 Problem statement

Regarding safe school, Ronald D. Stephens, United States National School Safety Center executive director (2013) was said that "Without safe schools, it is difficult, if not impossible for learning to take place". He states that safe learning environment is vital whereby students can learn and teachers can teach in a warm and welcoming safe environment. Shearn et al. (2006) in his research stated that risk education should be started at early stage of personal development.

Schools lacking conducive and safe environment for students and 85% out of 9586 secondary and primary schools in Malaysia were exposed to hazards. Most of the hazards are physical hazards, chemical hazards and biological hazards (Sabu et al., 2005). This lead to several incidents in school such as building structure falls, ceiling fan fall and netball goal post fell which claims some lives (Ssekamanya et al., 2016).

The main aim of The Malaysian Occupational Safety and Health Act 1994 (OSHA 1994) was enacted for securing the safety, health and welfare of the person at work, protecting others against risks to safety or health related to all the activities at work (OSHA, 1994). Therefore, school as a work place not excluded from this aim. It's become part of Ministry of Education responsibility to ensure all the school are in safe environment by sending circulars to schools regarding safety matters. Anyway those circulars not enough to safe guard of school communities. Those circulars does not state clearly how to do risk assessment (including how to identify hazards), what should be in safety policy, need or type of training (for teachers and staff) and type of proper safety signage. Study done by Makhtar et al, 2008 (in Malaysia) prove that safety policy, safety training and safety committee are very important to increase safety culture among school teacher. Ssekamanya et al., 2016, study on 380 teachers in Kuala Lumpur and Selangor primary schools shows that lacking on awareness about school safety and conclude that overall perceptions about school safety practices were low.

Current circular from Ministry of Education does not give any specific guidelines on identifying hazards, risk assessments and suggested control measures. It is just mentioning about the important of safety, to obey all safety rules in school and take necessary precaution during physical activities (MOE Circular, 1/1995), co-curriculum activities and any other field activities (MOE Circular,7/ 2011, 8/2011). School Concept and Safety Manual (2002) given some guidelines on students, parent, teachers and school counselor rolls in safety management of students activities, infrastructure safety, social problems, crisis and disaster management, and risk of treat from outside. Unfortunately, those guidelines or circulars did not specify any details on proper school safety evaluation method (only physical inspection) and on proper safety signage (not formal (MS2558:2014), only words. Several studies have found that warnings with symbols are more noticeable than warnings without symbols (Duarte et al., 2014).

Those guidelines, manuals and circulars also not mentioned about safety lines and vehicles parking lots for school teachers and staffs. They only mentioned the need of proper traffic flow inside the school compound. Furthermore, schools also do not have proper reporting system of injury from school until Ministry of Education level. Currently, the School Concept and Safety Manual (2002) only outlined the reporting of any injury in the school to the parents, nearest clinic and police (for claiming purpose). Due to this, the district, the state or the Ministry of Education do not have any statistic of injuries which happen in schools.

Health, safety and hygiene are vital in daily activities for every human being. That is one of the reasons why Ministry of Education included this topic in every Physical and Health Education text book from Year One to Year Six. The focus on physical fitness, human body, psychology problems among children, drug and alcohol, family relationship, communicable disease, stress management, nutrition and how to give first aid and getting help. The lacking part here is it does not include safety signs for hazards except for few road safety signage. Even, type of hazards in school also not given.

NIOSH Malaysia had launched 'OSH in School' programme in 2008 with a booklet named "Guide book on school occupational safety and health programme". Even though the guide book given example of hazards in schools and type of OSH activities that school can carry out, but it does not mention about safety signs for hazards. There is no publishable data for open access on number of accident or incident that happen in the schools in Ministry of Education or in Ministry of Health or Department of Statistic of Malaysia. Only through some studies, injury rate was calculated by taking data from hospitals or clinics in Malaysia. Those are the Third National Health and Mobidity Survey (NHMS III) (2006) findings that incident rate for injuries at 900 schools were 7.0 and a total of 1,846 school injuries with six deaths were reported at government hospitals and clinics in Malaysia for 3 months period from data collected by Junainah et al., 2002. This mean, number of injuries happen in school quite high. Those injuries can be reduced if proper safety control taken in school. Analysis from media report that reviewed by Ismail et al., 2017 and Makhtar et al., 2018, shows that there are 71 cases reported for year 2015 and 2016 (Table 1.1). This report not included road accidents that happen in front of school.

Table 1.1: Types of accident occur in the Malaysian school from 2015-2016

Type of accidents No. of cases	Number of cases
Crushed by heavy objects (ceiling, fan, goal post, flag pole)	11
Pierced by sharp objects (scissors, pencil, broken grate)	3
Stung by venomous snake	1
Chemicals and laboratory equipment were damaged	8
Struck by vehicle	1
Fall from the height	7
Perform school activities	2
Fire	7
Food poisoning	9
Structure failure	3
Accidence due to negligence	11
Mercury spill	15
Total	71

(Source: Ismail et al., 2017; Makhtar et al., 2018)

Junainah et al., 2002, study on mortality and morbidity data from hospitals in Malaysia (except Perlis) on school children injuries for 3 months found that 69.5% of injuries in schools were because of outdoor activities (out of the classroom). 63.1% of indoor and 43.2% of outdoor injuries caused by falls. Injuries due to falls were 60.6% of preschool and 61.8% of primary school children. She also identified that the main cause of injuries were sharp objects or cutting instrument, floor or flooring surfaces in schools (26.3% injuries was at the playground surface). Even many studies in other countries also relate primary school children injuries due to activities in classroom, outside classrooms, extra curricular activities, playground, school field, safety behaviour and attitude and road accidents. Those involved unintentional falls, colliding with another pupil when running, jumping and climbing (stairs), slippery surface, collisions or strikes, sprains, and cuts or sharp instrument injuries (Laflamme et al., 1999; Sun Y.H. et al., 2006; Salminen et al., 2014; Fang et al., 2015; Al-Hajj et al., 2020; Peltzer et al. 2015; Beranek et al., 2021).

Ridley (1986) in his book stated that 99% of accidents are due to unsafe acts or unsafe condition. Specific actions are needed to prevent and control child injuries and to minimize their consequences. Dr. Margaret Chan (Director General of WHO) stated that "Implementing specific actions proven child injury prevention interventions could save more than a thousand children's lives a day" (Peden,World Report on Child Injury Prevention, 2008). Just imagine, there are 7,733 primary schools with total pupils 2,814,681 in Malaysia whom are at risk of injuries that may due to unsafe act or unsafe condition. Furthermore, only 236313 teachers were taking care of those pupils (MOE, 2013). Once the pupils in the school, it is the school teacher's responsibility to taking care the pupils as a guidance (Taufik et al., 2015). Study in Czech Republic school injuries conclude that insufficient supervision by adults and lack of knowledge on the part of children regarding how to avoid the risk of an injury causes of injuries (Beranek et al., 2021) . Therefore, risk assessment is very important in managing safety in primary school to reduce the unsafe act or unsafe condition risk (Ewart, 2009; Belinder,

2009; Vicario et al., 2012). At the same time, prevention programs on reducing injuries in Czech Republic schools really works and have a positive impact in reducing injuries in schools (Beranek et al., 2021). Means, safety signage and lines also can prevent injuries in schools.

To reduce or eliminate risks in learning, risk needs to be assessed and managed. Risk assessment and management refers to the act where risks that may be present in particular locations or activities are formally identified in order to plan how the risks may be reduced (Beames et al.2012) or eradicated. The study done by Ismail et al., 2017 covered 6 locations for risk assessment. His findings shows playing field and teacher's room were high risk, classroom, canteen and toilet in medium risk, and drainage in low risk. He did covered other area of school such as parking area (car, motorbike and bicycle), school hall, special classroom (computer lab, science lab, skill room lab) corridors, monsoon drain, stores, playground, stairs, pupils waiting area, septic tank area, school location and road safety (in front of school).

From above discussion, we can conclude the lacking part in risk assessment are identification of hazards in school in Malaysia not fully covered all the places or location in school environment (Ismail et al., 2017). Few previous studies in Malaysia on occupational implementation and practices in schools not covered some of parts such as legislation (OSHA) fire safety and accident records and the respondent are teachers not school safety coordinators. (Makhtar et al., 2018; Noraine et al., 2019 (study 13 preschools); Ssekamanya et al., 2016) Guidelines given in School Safety Manual (2002), MOE circulars and school physical and health education book does not covered proper safety signage as in MS2558:2014 and proper evaluation method for school safety.

Therefore the aim of this study is to identify hazards in all location in school area, assess the risk (for risk rating) and come with control measures for each location. Then, this study also evaluate how far the implementation and practices of occupational safety in school with respondent are every school's safety coordinators. From the risk assessment, one of control measure is safety signage and lines (under administrative control) was intervene for primary schools (newly modified safety signage). Furthermore, for all the hazards that identified, control measures also was suggested to reduce or eliminate those hazards. For those hazards, especially unsafe condition which can't be eliminate or reduced, safety signage and lines was one of administrative control measures to avoid incidents and injuries among the primary school children. Those signages need as a temporary signage until the hazard is fully controlled. If, the hazards can't be control, the safety signages (warning sign and prohibited signage) can be permanent suggestion to warn children and staff. A part of that, some of safety instruction signages (use handrail, no pushing) and safe condition signage (fire exit sign and emergency assembly area) also added. For flooring surface which is slippery can use caution signage to avoid injury due to slip and fall. Not all the safety signages will be included since some of hazards need more to detail instruction signage such as for cutting instruments (knives, cutter and scissors) when to use, how use and the precaution that should take when use it.

For the first attempt, new modification of workplace safety signs and safety lines (floor marking) (MS2558:2014) was intervene to exposed and to get pupils understanding on safety signage with picture symbol. The intend of research was to improve pupils understanding on safety signs and lines which eventually reduced possibility of unsafe act and to warn unsafe condition to reduce incidents and injuries in the future. In addition to this, safety line (or floor marking, tapes) was also introduced. This is extra signage that was aim to exposed children about safety precaution where ever they go. Safety line (floor marking) now used widely in many places to warn people on dangerous area and for unavoidable hazard (example stairs, trip, floor level obstacle, uneven floor) (ISO3864-1:2011). In fact, Ismail et al., 2017 was suggested in his study to use safety tapes (lines) and warning sign to caution pupils from risky area or hazards.

To make pupils to get knowledge and understand the modified safety signage, training module was also introduced. In this training module all the newly modified safety signage and lines were interpreted and teach the pupils about it before post test of safety signage and lines questions given. Previous studies only focus on adult's perspective in designing the safety signage and only few studies on children perspective to safety sign design and colours (Iftadi et al., 2018). Thus, this study focus on children understanding and knowledge on new modified safety signage with pictures or symbols.

Novelty

This is the first attempt to develop and modify workplace safety signages (MS2558_2014; ISO3864-1:2011) for school as a part of safety preparedness by school administrator. Those safety signage and lines will deliver safety related information to warn the school pupils about the potential hazards and so they can take reasonable actions. This is also to reduce any unwanted incidents or accidents in primary schools in future. Furthermore, the outcomes of risk assessment and occupational safety implementation and practices can further improved school safety and health practices.

Research question

1. What are the hazards in the primary schools?
2. What are the relative risks value (RR value) for primary schools?
3. How far the knowledge of school safety coordinators about school safety?
4. How far the implementation and practices of school safety programs in school?
5. How far the knowledge of pupils on current and newly modified safety sign and safety lines in intervention school?

1.3 Significance of the study

In Malaysia, students spend 6 to 7 hours in school from Monday to Friday and 2 to 3 hours more on co-curriculum activities or extra classes from 2pm to 5pm for 190 days of a year. It's mean that students spends almost one third of their daily life in school. Therefore, the safe environment must be establish to reduce injuries among the students

and also for the teachers and staff. Safe environment also will ensure effective learning process occurs in schools (Tabancali et al., 2009). Fang etal. (2015) states that elementary school children more injuries (incident rates 10.8% in Xiamen, China) because more playful and lack of self-awareness of protection.

The outcome of risk assessment using HIRARC method (DOSH HIRARC, 2008) will help us to find out all the hazards and level for primary schools. From this, the necessary control measures or precautions can be made in order to improve safety condition and practices in the primary school. The hazards that identified from the study will give us clear picture of type of hazards and how risk they are in possibility of causing injuries to school pupils. Ismail et al., 2017 support this whereby high risk hazards can harm school communities. So, necessary steps can be taken by school administrative to reduce hazards in school and monitor risky area with safety tapes (or lines) or placing warning signs to cautions pupils about. One of the way to control hazards in work environment is use of safety signs which carry safety information to prevent injury (Davoudian et al., 2017). From the feedback given by the school safety coordinators, we will be able to identify the lacking part of occupational safety implementation and practice in schools. With this information, we can suggest to Ministry of Education to improved occupational safety and health in schools. Even, implementation of risk assessment for every schools can be suggested. School safety coordinators or management can be train in using HIRARC guidelines in schools. The hazard information they gain will help them to come out with more effective control measures to overcome hazards, minimize injuries, prevent accidents and will guide on emergency evacuation in future.

The other important part of this study is the outcome from exposure and understanding of newly modified safety signs and lines at intervention school. Those signages was expected with give the pupils the first exposure to safety signage and they can take necessary precaution. It will also help them to take caution wherever they see safety signage outside of school environment. For example, slippery floor signage can be seen in shopping mall, hospitals or at any other premises whenever process of cleaning going on. This supported by several successful studies on using of safety signage and safety markings (lines) at workplace and public area to prevent accident and incidents (Tam et al. 2003, Wong et al. 2007; Luria et al. 2008, Filippidis et al. 2009; Alan et al. 2010, Bradly, 2018). Izzahinani et al.(2020) on her study on road safety signage application for kids, also stress out the important of safety signage that kids should be expose to safety signage from early age such four to seven years old.

The primary schools pupils will be able to take necessary precaution and be always alert with the all type of safety signs and safety lines which are going to be putting up in schools. They also will gain some knowledge on safety signs and safety lines which will be useful in their daily life. It is also to change human behaviour to obey safety signs and lines and to be more responsible. Even, in Meis et al., 2017 study on safety sign is tool for behaviour change had conclude that safety signs are an important and inexpensive method for changing behavior and understanding the underlying mechanisms in behavior change through signage is fundamental for effective signage in the future. For example, when this pupils cycling in the parks or to school, they will obey the road safety signage and other signages in the parks.

Correct interpretation and understanding of safety signage will prevent injuries and safe life (Davoudian et al., 2013). Once safety signage become familiar with them, it will remind them in life until they start to work in industries or elsewhere in future whereby safety signage is one of important administrative control measure to avoid accident. This indirectly will increase safety awareness and knowledge among the future generation of workers in Malaysia.

The safety lines (including vehicles parking lines) in school will ensure the proper systematic movement of school children when they walk to their classrooms, canteen, school field and other places in school compound. They also need to be aware about the restricted area that they should not walk through or be there. Eventually, this will enhance safety of primary school children and prevent any injuries to them. It also will prevent any damages to school properties when the children are not allowed to the restricted areas or rooms or routes. Safety lines tape or paint can be provide effective visibility with bright and variety colour (red and white stripes, yellow and black stripes, green and white stripes) can improve workplace safety by reduce trip hazards,walking part safety and safe workers from unsafe areas (Bradly, 2018). World report on child injury prevention (Peden, World Report on Child Injury Prevention, 2008) outlined that child injuries were predicTable and prevenTable. Therefore, it is vital to create awareness among school children, communities, policy-makers, health care personnel and donors about its prevent-ability in order to prevent the loss of healthy life in the youngest members of our community. The report also mentioned that children whom gain knowledge on safety can promote injury prevention among peers and family. It is a hope that with this study the children whom gained the knowledge on safety signage can share it with their friends and family wherever they go.

1.4 Research objective

1.4.1 General objective

To assess the risk, evaluate occupational safety implementation and practices and to intervene newly modified safety signage and safety lines for the intervention and control group among the primary school pupils in Larut, Matang and Selama district, Perak state, Malaysia.

1.4.2 Specific objectives

The specific objectives of this study are:

1. To identify hazards in all the primary schools in LMS district.
2. To assess the relative risks value (RR value) for hazards that was identified from all the primary schools in LMS district.
3. To evaluate OSH implementation and practices (OSH act, school programs, training, security and emergency) in the LMS district primary schools.

4. To develop new modified safety signages for selected hazards for school use.
5. To determine and compare newly modified safety signs and lines knowledge:
    - between pre-test, post-test and post-test 2 of safety signage and lines differences for intervention group.
    - between pre-test and post-test of safety signage and lines difference for control group.
    - pre-test between intervention and control group.
    - post-test between intervention and control group
    - between post-test 2 after three months of intervention with pre-test and post-test for intervention group.

1.5 Research hypotheses

- There is a significant differences between pre-test score, post-test score and post-test 2 score of safety signage and lines for intervention group.
- There is a significant differences between pre-test score and post-test score of safety signage and lines for control group.
- There is a significant differences between intervention and control group for pre-test score and post-test score of safety signage and lines.

REFERENCES

Abel M.H., Sewell J. (2010). Stress and Burnout in Rural and Urban Secondary School Teachers. J. Edu. Research. Vol.92:5, 287-293.

Aday, L.A.. Llewellyn J.C. (2006). Designing and conducting health surveys : a comprehensive guide. Foreword by Steven B. Cohen.—3rd ed. John Wiley & Sons, Inc.

Agwu M.O. (2012). The Effects of Risk Assessment (Hirarc) on Organisational Performance in Selected Construction Companies in Nigeria. British Journal of Economics, Management & Trade 2(3): 212-224, 2012.

Afizudin I., Azhar A., Yi A.L.L (2017). Physical and Health Education Year 5 for National Primary School. Dewan Bahasa dan Pustaka pub.

Aksorn T. Hadikusumo B.H.W. (2007).The Unsafe Acts and the Decision-to-Err Factors of Thai Construction Workers Construction in Developing Countries. *Vol. 12, No. 1, 2007*.

Al-Hajj S., Nehme R., Hatoum F., Zheng A., Pike I.. (2020). Child school injury in Lebanon: A study to assess injury incidence, severity and risk factors. PLoS ONE 15(6): e0233465. Retrieved from https://doi.org/10.1371/journal.pone.0233465 (Accessed 21.6.2021)

Alan H.S.C., Annie W.Y. N. (2010). Effects of sign characteristics and training methods on safety sign training effectiveness. *Ergonomics. Vol.53:11, 1325-1346.*

Al-Samghan A., Al-Shahrani F.M., Al-Shahrani F (2015). Primary School Teachers' Knowledge about First-Aid. Med. J. Cairo Univ., Vol. 83, No. 1, June: 541-547 (2015).

Allen, R. W., Parseghian, Z. and van Valkenburgh, P. G (1980). Simulator evaluation of age effects on symbol sign recognition. Proceedings of the Human Factors and Ergonomics Society 24th annual meeting. pp.471–475. Santa Monica, CA: Human Factors and Ergonomics Society.

ANSI-Z535 and ISO Safety Labels (2013). Brimar Industries, Inc. USA. Retrieved from http://www.safetysign.com/help-ansi-z535-iso-3684-safety-symbols.php (Accessed 23.7.2014).

APOSHO 26 (2011). Asia Pacific Occupational Safety and Health Organization: Enhancing Safety Across Cultures. Australasian Safety Conference 2011. Retrieved from www.ifap.asn.au/. (Accessed 23.7.2013)

Apostolico A.A, Shendell D.G. (2016). Injury surveillance and associations with socioeconomic status indicators among youth/young workers in New Jersey secondary schools. *Environmental Health* (2016) 15:22

Amazigo U., Nancy S., Joan K. and Daniel S. O. (1997). Sexual Activity and Contraceptive Knowledge and Use Among In-School Adolescents in Nigeria. International Family Planning Perspectives, 23:28-33. Retrieved from http://www.undp.org/popin/journals/ifpp/ifpp231/2302897.htm

ASTI (2013). Association of Secondary Teachers, Ireland. http://www.asti.ie/operation-of-schools/legislation/safety-health-and-welfare-at-work-acts/ (Accessed 16.8.2013)

Azeredo R., Stephens S.S (2003). Design and implementation of injury prevention curricula for elementary schools: lesson learned. *Injury Prevention 2003:9;274-278.*

Babbie, E. (2001). *The Practice of Social Research*. 9th Ed. Belmont, CA: Wadsworth Thomson.

Barrett J (2020). Safety Symbols and Their Meanings. AD Safety Network. Retrieved from https://www.safeopedia.com/safety-symbols-and-their-meanings/2/6550 (Last updated: September 22, 2020) (cited 12 June 2021).

Barlow, T., Wogalter M.S. (1993). Alcoholic beverage warnings in magazine and television advertisements. *Journal of Consumer Research*, 20, 147–155.

Beames, S., Higgins, P., and Nicol, R. (2012). Learning outside the classroom: Theory and guidelines for practice. Routledge pub.

Belinder E., John B. (2009). Ealing Education Service, United Kingdom. Retrieved from http://www.egfl.org.uk/categories/safety/hs/cops.html. www.ealing.gov.uk.

Benthorn L., Frantzich H. (2000). Fire alarm in a public building: how do people evaluate information and choose an evacuation exit? Fire and Materials. Vol.23. Issue 6 (Accessed 8.2.2019)

Beranek V., Stastny P., Novacek V. (2021). School injuries and their prevention from the present perspective. Baltic Journal of Health and Physical Activity 2021; 13 (1): 45-53. doi: 10.29359/BJHPA.13.1.06.

Bian J., Fu H., Jin J. (2020) Are We Sensitive to Different Types of Safety Signs? Evidence from ERPs. Psychology Research and Behavior Management 2020:13 496.

Blees G.J., Mak W.M. (2012) Comprehension of disaster pictorials across cultures, Journal of Multilingual and Multicultural Development, 33:7, 699-716, DOI: 10.1080/01434632.2012.715798

Bong Y.B., Shariff A.A., Majid A.M., Merican A.F. (2012). Reference Charts for Height and Weight of School Children from West Malaysia in Comparison with the United States Centers for Disease Control and Prevention. *Iran J. Public Health.* 2012:41(2):27-38. PMC3481677.

Bradly (2018). Floor marking guide. Brady Worldwide Inc. All Rights Reserved. Retrieved from https://d37iyw84027v1q.cloudfront.net/common/floor_marking_ guide.pdf (Accessed 23.6.2021)

Braun, C. C., & Silver, N. C. (1995). Interaction of signal word and color on warning labels: Differences in perceived hazard and behavioral compliance. *Ergonomics*, 38, 2207–2220.

British Standard, BS 8800, BSI 2004: Occupational health and safety management systems – Guide and Managing Safety the Systems Way: Implementing OHSAS 18001 using BS 8800, BSI 2004.

Centre for Chemical Process Safety (2010) / AIChe. Retrieved from www.knovel.com.

Chan YH (2003).Biostatistics 102: Quantitative Data_Parametric and Non-parametric Tests. *Singapore Med. J.* 2003;Vol.44(8):391-396.

Chantravalli K. (2018). Relationship between transformational leadership, school culture and safety management in elementary schools in Pahang, Malaysia, PhD dissertation. University Putra Malaysia.

Chiaviello CT, Christoph RA, Bond GR. Stairway-related injuries in children. *Pediatrics*.1994;94:679–681. Retrieved from http://pediatrics.aappublications.org/content/94/5/679 (Accessed 9.7.2017)

Civil Service Department (2013). http://www.jpa.gov.my/docs/pilmu/ProfilAwam.pdf. (Accessed 30.9.2013).

Clarion Safety System (2013). New OSHA/ANSI Safety Sign Systems for Today Workplace: Clarion Implementation Guide. https://www.ishn.com (Accessed 30.7.2017)

C.K Lee (2008), *Implementation of Hazard Identification, Risk Assessment and Control (HIRAC) on Construction sites*. UTM, Malaysia.

Colling, David A (1994). *Industrial Safety: Management and Technology*. Englewood Cliffs, N.J : Prentice Hall.

Cook T., Wong V. (2008). Better quasi-experimental practice. In P. Alasuutari L., Bickman J., Brannen (Eds.). The Sage handbook of social research methods (pp.134–164). London: Sage.

Coppens NM, Koziara DM.(1997). Children's perceptions concerning school injuries. *J. Sch. Nurs.* 1997. Aug;13(3):14-9. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9283378 (Accessed 2.2.2015).

Corder G.W., Foreman D.I.(2009). Non-parametric statistics for non-statistician: A step-by-step approach. John Wiley and Sons pub.

Cowan, K. C., Vaillancourt, K., Rossen, E., & Pollitt, K. (2013). A framework for safe and successful schools [Brief]. Bethesda, MD: National Association of School Psychologists. Retrieved from www.nasponline.org/schoolsafety framework (Accessed 8.6.2016)

Crisp P.(2013). School risk matrix: assessing the severity of risk. Risk assessment and control of risks. Safety in Schools. EcoSolve Australia. Retrieved from www.riskassess.com.au/assets/RiskMatrix.pdf. (28.7.2013).

Dania Z (2016). Chronology of students killed by falling goalposts in Malaysia. https://www.astroawani.com/berita-malaysia/chronology-students-killed-falling- goalposts-malaysia-110924 (Assessed 14.7.2016)

Davies, D.,Haines, H.,Norris, B., & Wilson, J. R. (1998). Safety pictograms: Are they getting the message across? *Applied Ergonomics*, 29, 15–23.

Davoudian T.A.H, Meshkani M., Mofidi A., Mollakazemiha M. (2013). Evaluation of the Perception of Workplace Safety Signs and Effective Factors. IJOH: Vol. 5: 3:117-122.

Davoudian T.A.H., Azari G.R (2017). Safety signs perception and adoption with ISO and ANSI standards. Jundishapur J Health Sci. In Press(In Press):e12911. doi:10.5812/jjhs.12911.

Department of Occupational Safety and Health Malaysia (2019). Legislation and Guidelines. https://www.dosh.gov.my/index.php/legislation/guidelines. (Accessed 17.8.2019)

Department of Occupational Safety and Health Malaysia (2008). Guidelines for hazard identification, risk assessment and risk control (HIRARC). Ministry of Human Resources Malaysia. JKKP DP 127/789/4-47. ISBN 978-983-2014-62-1.

Department of Occupational Safety and Health Malaysia (2004). Guidelines on First-Aid In Workplace. Ministry of Human Resources Malaysia. JKKP GP(I)06/2004. ISBN 983-2014-43-3.

Department of Occupational Safety and Health 1996. Guidelines on Occupational Safety and Health in The Office.

Department of Occupational Safety and Health Malaysia (2018). Guidelines for Manual handling at workplace. ISBN9789832014928.

Department of Occupational Safety and Health Malaysia (2003). Guidelines on OSH for seating at work. JKKP : GP (I) 2/2003. ISBN : 9832014255.

Department of Occupational Safety and Health Malaysia (2002). Guidelines on OSH for standing at work. JKKP : GP (I) 02/2002. ISBN 9832014212.

Department of Occupational Safety and Health Malaysia (2017). Guidelines on Ergonomics Risk Assessment at Workplace. ISBN9789832014874.

Drown D. (2013). Industrial Hygiene Qualitative Risk Assessment. DrownEHS.com. Retrieved from http://www.dir.ca.gov/dosh/cal_vpp/Best_Practices_Symposiums/ IH_Assesement.pdf (Accessed 28.7.2013)

Duarte E., Francisco R., Teles J., Wogalter M.S. (2014). Safety sign comprehension by students, adult workers and disable persons with cerebral palsy. *Safety Science*: 62(2014) 175-186.

Education Act (1996). Act 550. ILBS pub.2010 edi.

Education (Parent - Teacher Association) Regulations, 1998. ILBS pub.2010 edi.

Ewart B., Boniface J. (2009). Key Risk Assessment for Schools. School Safety and Site Management. Ealing Education Service. Retrieved from www.egfl.org.uk/categories/safety/hs/cops.html (Accessed 28.7.2013).

Fairuz Zaidan (2016). Year 1 pupil fall into septic tank hole (Murid Tahun 1 maut jatuh dalam lubang kumbahan: 1.2.2016). Retrieved from http://www.bharian.com.my/node/120224 (Accessed 30.4.2017)

Fang Y., Zhang X., Chen W, Lin F, Yuan M., Geng Z., Yu H., Dai L. (2015). Epidemiological characteristics and burden of childhood and adolescent injuries: a survey of elementary and secondary students in Xiamen, China. *BMC Public Health.* 2015:15:357. DOI 10.1186/s12889-015-1726-1.

Filippidis, Lazaros, Galea, Edwin R., Blackshields, Darren and Lawrence, Peter (2009). *Experimental study of the effectiveness of emergency signage.* In: Human Behaviour in Fire 2009 - Conference Proceedings. Interscience Communications Ltd., Greenwich, London, UK, pp. 289-300.

Fire and Rescue Department of Malaysia. Ministry of of Housing and Local Government. https://www.bomba.gov.my/index.php/pages/view/3?mid=210 (Accessed 27 Jun 2021).

Ganpatrao JS (2014). Knowledge and practices of school teacher regarding disaster management. *Int. J Health System Disaster Manage*. 2014;2:98-102

Gao, J., Wu, X., Luo, X., Guan, S. (2021) Scientometric Analysis of Safety Sign Research: 1990–2019. Int. J. Environ. Res. Public Health 2021:18:273. Retrieved from https://doi.org/10.3390/ ijerph18010273 (Accessed 27.6.2021).

George D., Mallery P. (2019). IBM SPSS Statistics 25 Step by Step: A Simple Guide and Reference. 5th edi. Taylor & Francis pub.

Gielen A.C., Dannenberg A.L., Ashburn N., Kou J. (1996). Teaching safety: evaluation of a children's village in Maryland. *Inj Prev.* 1996 2:26-31.

Gill, R. T., Barbera, C., & Precht, T. (1987). A comparative evaluation of warning label designs. In Proceedings of the Human Factors Society 31st Annual Meeting (pp. 476–478). Santa Monica, CA: Human Factors and Ergonomics Society.

Göpfert A, Van Hove M, Emond A, Mytton J. (2018). Prevention of sports injuries in children at school: a systematic review of policies. BMJ Open Sport & Exercise Medicine 2018;4:e000346. doi:10.1136/bmjsem-2018-000346.

Gresham L.S., Zirkle D.L., Tolchin S., Jones C., Maroufi A., Miranda J. (2001). Partening for injury prevention: evaluation of a curriculum-based intervention program among elementary school children. *Journal of Pediatric Nursing* Vol. 16 (2): 79-87.

Guidelines on Occupational Safety and Health Management Systems (2011). Department of Occupational Safety and Health. Ministry of Human Resources Malaysia.

Guptil C., Zaz C. (2010). Injury prevention: What music teachers can do. Music Edu. J. Vol.96, No.4 pp28-34. https://www.jstor.org/sTable/40666426 (Accessed 12.7.2017))

Hadi A.A., Naing N.N., Daud A., Nordin R., Sulong M.R. (2009). Prevalence and factors associated with stress among teachers in Kota Bharu, Kelantan, Malaysia. *Southeast Asian J. Trop. Med. Public Health.*Vol 40: 6, 1359-1370.

Hancock H.E., Rogers W.A. Schroeder D., Fisk A.D. (2004). Safety Symbol Comprehension: Effects of Symbol Type, Familiarity, and Age. Human Factors: The Journal of the Human Factors and Ergonomics Society 2004 46: 183. DOI: 10.1518/hfes.46.2.183.37344 (Accessed 17.12.2013)

Health and Safety Checklist for Classroom (2011). Health and Safety Executive pub. Retrieved from www.hse.gov.uk/risk/classroom-checklist.htm. Crown copyright 2011.

Health Education Department (2017). Current dengue situation. https://www.infosihat.gov.my/index.php/demam-denggi (Accessed 12.7.2017).

Heinze J. (1997). "*The distraction theory of accident causation*." Proc., Int. Conf. on Implementation of Safety and Health on Construction Sites, CIB Working Commission W99: Safety and Helath on Construction Sites, 119-127.

Hendricks C.(2008). How safe your classroom? Identifying hazards before accidents happen. Early Childhood News. The professional resource for teachers and parents. Excelligence Learning Corporation.

http://www.earlychildhoodnews.com/earlychildhood/article_view.aspx?ArticleI D+273 (Accessed 15.8.2013)

Holder Y, Peden M, Krug E, Lund J, Gururaj G, Kobusingye O. (2001). *Injury Surveillance Guidelines.* Geneva, World Health Organization, Switzerland. Retrieved from whqlibdoc.who.int/publications/2001/9241591331.pdf (Accessed 7.1.2014)

Iftadi I., Nugraha D.C., Jauhari W.A (2018). Safety sign designs for children by considering effect of the colors preferences:A case study. AIP Conference Proceedings 1931, 030028 (2018); Retrieved from https://doi.org/10.1063/1. 5024087. Published Online: 09 February 2018

Indiatoday (2016). 12-year old boy falls into septic tank in school, dies (1.4.2016). Retrieved from http://indiatoday.intoday.in/story/12-year-old-boy-falls-into-septic-tank-in-school-dies/1/632346.html (Accessed 30.4.2017)

Indiatoday (2018). Boy falls to death in septic tank while-playing (21.11.2018). Retrieved from https://www.indiatoday.in/pti-feed/story/boy-falls-to-death-in-septic-tank-while- playing-1392913-2018-11-21 (Accessed 27.6. 2020)

ISO/IEC GUIDE 51:2014(E). Safety aspects — Guidelines for their inclusion in standards. Third edi. 2014-04-01.Retrieved from http://isotc.iso.org/ (Accessed 22 July 2017)

Industial Accident Prevention Association (IAPA)(2007). Safety signs and Colour at Work. A health and Safety Guideline for your Workplace. United States of America. www.iapa.com.

Ismail A.R., Noor A.H., Nor K.M., Daud K., Khidzir N. Z. (2017). Risk assessment in infrastructure in educational institution: A study in Malaysia.4th International Conference on Mechanical Engineering Research (ICMER2017)

Ismail A.R., NA.H., Makhtar N.K., Hassan N.H.C., Mohamad D., Deros B.M.(2018). A study of road hazards faced by Malaysian school children using HIRARC. Malaysian Journal of Public Health Medicine. Vol(2):10-17.

ISO 17724 (2003). Graphical symbols – Vocabulary ISO 3864-1. www.iso.org

ISO 3864-1(2011). Graphical symbols – safety colours and safety signs – Part 1: Design principles for safety signs and safety markings. International Standard. 2nd edition. 2011-04-15. Switzerland pub. www.iso.org.

Izzahinani A.H., Aini Z. A. K., Amarah A., Norhayatie I. (2020) Safety road signage application for kids. International Journal of Synergy in Engineering and Technology (IJSET) Vol. 1 No. 1. pp. 1-8.

Perak State Education Department (Jabatan Pendidikan Negeri Perak, JPNP)) http//www.pendidikanperak. gov.my (Accessed 21.6.2013, 12.7.2017)

Ians (2018). Paint, varnish exposure may increase risk of multiple sclerosis. https://indianexpress.com/article/lifestyle/health/paint-varnish-exposure-may-increase-risk-of-multiple-sclerosis-5245619/.

Jaynes, L. S., & Boles, D. B. (1990). The effects of symbols on warning compliance. In Proceedings of the Human Factors Society 34th Annual Meeting (pp. 984–987). Santa Monica, CA: Human Factors and Ergonomics Society.

John T.A., Krishnan R. (1994). Some Epidemilogical Aspects and Economic Cost of Injuries in Malaysia. *Asia-Pasific Journal of Public Health 7(11):16-20.*

Junainah S. (2002). Epidemiology of School Injuries in Malaysia. *Jurnal Kesihatan Masyarakat Isu Khas: 14-22.*

Kalsher, M. J., Wogalter, M. S., & Racicot, B. M. (1996). Pharmaceutical container labels and warnings: Preference and perceived readability of alternative designs and pictorials. *International Journal of Industrial Ergonomics*, 18, 83–90.

Kamus Dewan Bahasa Pustaka (Dictionary Dewan Bahasa Pustaka) (2017). Retrieved from https://prpm.dbp.gov.my/cari1. (edisi keempat) (Accessed 30.7.2017)

Kidsafe Queensland (2013). Safety in schools week. School grounds safety checklist. Retrieved from http://www.kidsafeqld.com.au/school-safety . Last update 30 September 2013 (Accessed 18.12. 2013).

Kim S. Wogalter M. S. (2015). Effects of emphasis terminology in warning instructions on compliance intent and understandability. *Journal of Safety Research* 55:pp 41–51.

Kindler L (2011). Signs and safety at work. SAFE-T1: Resource Centre for teachers and students. www.safe-t1.netau. /assets/files/resource/Safety&signs.pdf. Developed 11.10.2011. Retrieved 21.6.2013.

Klein, P. B., Braun, C. C., Peterson N., & Silver, N. C. (1993). The impact of color on warnings research. In Proceedings of the Human Factors Society 37th Annual Meeting (pp. 940–944). Santa Monica, CA: Human Factors and Ergonomics Society.

Kokkinos C.M. (2007). Job stressors, personality and burnout in primary school teachers. *British J. Edu. Psychology. Vol.77:1, pp. 229-243.*

Kobes M., Helsloot I., Vries B. de., Post JG (2010). Building safety and human behavior in fire: A literature review. *Fire Safety Journal* 2010:45;1-11.

Kyriacou C. (2001). Teacher Stress: Directions for future research. *Edu. Review. Vol.53:1, pp 27-35.*

Laflamme L., Menckel E., Aldenberg E. (1998). School injuries determinants and characteristic: developing an investigation instrument from a literature review.

Accid. Anal. and Prev. Vol. 30, No. 4, pp. 481–495. PII: S0925-7535(99)00026-0.

Laflamme l., Menckel E. (1999). Injuries in Swedish schools during recesses: distribution and patterns. Safety Science 33 (1999):pp 89-101

Lanco Safety Data Sheet: polyurethane (2015). http://www.lancopaints.com/files/5714/7865/3460/SDS_Polyurethane_Varnish_Gloss_15_Min_PV360_EN.pdf (Accessed 21.10.2015)

Landau S., Everitt B. (2004). A Handbook of Statistical Analysis using SPSS. Chapman and Hall/CRC Press LLC. ISBN 1-58488-369-3

Laughery, K. R., & Smith, D. P. (2006). Explicit information in warnings. In M. S.Wogalter (Ed.), Handbook of warnings (pp. 419–428). Mahwah, NJ: Erlbaum. ISBN 9780805847246. CRC Press pub.

Laughery K. R., Wogalter M. S. (2006). Review of Human Factors and Ergonomics: Designing Effective Warnings. Chap.8, pp. 241–271). Pub. April 1, 2006. Retrieved from http://journals.sagepub.com/doi/pdf/10.1177/1557234X0600200109 (Accessed 10.6.2015)

Laughery, K. R., & Young, S. L. (1991). Consumer product warnings: Design factors that influence noticeability. In Proceedings of the 11th Congress of the International Ergonomics Association (pp. 1104–1106). London: Taylor & Francis.

Lee L.T (2011). Making OSH a culture through OSH in school. APOSHO 26. Australasian Safety Conference, 2011.

Lee L.T (2016). School must adopt OSH. The Star Online, 15 July 2016. Accessed through https://www.dosh.gov.my/index.php/osh-column/osh-articles/1744-schools-must-adopt-osh (Accessed 8.1.2017).

Lemerle K.A. (2005). Evaluating the impact of the school environment on teachers' health and job commitment: Is the health promoting school a healthier workplace? PhD thesis, Queensland University of Technology (Electronic version).

Lesch M.F., Horrey W.J., Wogalter M.S., Powell W.R. (2011). Age-related differences in warning symbol comprehension and training effectiveness: effects of familiarity, complexity, and comprehensibility. *Ergonomic*, 54:10, 879-890. Taylor & Francis. DOI: 10.1080/00140139.2011.606924.

Lesch M.F. (2008). Warning symbols as reminders of hazards: Impact of training. *Accident Analysis and Prevention J.* 40(2008):1005-1012.

Lehto, J. R., & Miller, J. M. (1988). The effectiveness of warning labels. *Journal of Product Liability*, 11:225–270.

Lisa M. Given (Ed.) (2008). The Sage Encyclopedia of Qualitative Research Methods. Sage: Thousand Oaks, CA, Vol.2, pp.697-698. www.sfu.ca.

LMS Land and District Office (Pejabat Daerah dan Tanah Larut, Matang dan Selama). http://pdttaiping.perak.gov.my. Retrieved 15.8.2013

Lunenburg F.C. (2010). Environmental Hazards in America's Schools. Focus on colleges, universities and schools. Vol. 4, No.1(2010). Retrieved from http://www.nationalforum.com/Electronic%20Journal%20Volumes/Lunenburg, 20Fred%20C.%20Environmental%20Hazards%20in%20America's%20Schools % 0FO CUS%20V4%20N1%202010.pdf (Accessed 21 June 2021)

Luria G., Rafaeli A. (2008). Testing safety commitment in organizations through interpretations of safety artifacts (safety signs). *Journal of Safety Research 39: 519–528.*

Luximon A., Chung L. W., Goonetilleke R.S. Safety Signal Words and Color Codes: The Perception of Implied Hazard by Chinese People. *Proceedings of The 5th Pan-Pacific Conference on Occupational Ergonomic. Pp. 30-33.*

Lugah V., Ganesh B., Darus A., Retneswari M., Rosnawati M.R., Sujatha D. (2010). Training of occupational safety and health: knowledge among healthcare professionals in Malaysia. *Singapore Med. J.* 2010;51(7):586-591.

Makhtar N.K., Parasuraman B., Zakaria M.N., Ismail A.R. (2018). Safety Culture and Its Contributing Factor in Education Sector in Malaysia. Conference Paper in Advances in Intelligent Systems and Computing, July 2018. DOI: 10.1007/978-3- 319-60525-8_47. Retrieved from https://www.researchgate.net/publication/ 318156664.

Malaysian Standard, MS2558:2014 (2014). Safety and health signage used in the workplace – Specification (First revision). Department of Standard Malaysia pub.

Malaysia Third National Health and Mobidity Survey (NHMS III) (2006). Ministry of Health.

Malaysia Tourism (2013). Retrieved from https://tourism.gov.my/

Malaymailonline (2014). For blinding boy, court orders Putrajaya to pay RM178,770. (11.4.2014). Retrieved from https://my.news.yahoo.com/blinding-boy-court-orders-putrajaya-pay-rm178-770-225500097.html (Accessed 12 Apr 2014).

Manar A.A., Lamya H.A., Fatma M.A., Ahmed M.A (2020). Incidence of School-related Injuries among Students in A'Dakhiliyah Governorate Schools, Oman. Oman Med. J.(2020).Vol.35.No.2: e127.

Masih S., Sharma R.K., Kumar A. (2014). Knowledge and practice of primary school teachers about first aid management of selected minor injuries among children. *Int. J Med Public Health* 2014;4:458-62.

Matthews B., Andronaco R., Adams A. (2014). Warning signs at beaches: Do they work? *Safety Science* 62(2014):312-318

Mauthner M. (1997). Methodological Aspects of Collecting Data from Children: Lessons from Three Research Projects. *Children and Society. Vol.11:16-28*. John Wiley & Sons.Ltd.

Michielsen K., Beauclair R., Delva W., Roelens K., Temmerman M. (2012). Effectiveness of a peer-led HIV prevention intervention in secondary schools in Rwanda: results from a non-randomized controlled trial. *BMC Public Health.* 2012,12:729.

Ministry of Education. www.moe.gov.my /statistic (Accessed: 2013, 2014, 2015, 2017).

Mohd.Y. I. (2008). *Application Occupational Safety and Health In Industry Case Study*: CCM Fertilizers Sdn Bhd

MOE Circular 1/1995. Pupils safety during physical and health education lesson, co-curriculum activities and sports inside and outside school area. Ministry of Education (Surat Pekeliling Ikhtisas Bil. 1/1995. Keselamatan diri pelajar semasa Pengajaran pendidikan jasmani dan kesihatan serta kegiatan kokurikulum dan sukan di dalam dan di luar kawasan sekolah. Kementerian Pendidikan Malaysia).

MOE Circular 1/1995. Management of pupils safety during physical education lesson. Ministry of Education (Surat Pekeliling Ikhtisas Bil. 1/1995. Pengurusan keselamatan murid sewaktu pengajaran pendidikan jasmani. Kementerian Pendidikan Malaysia).

MOE Circular 4/2002. Implementation of school safety program. Ministry of Education (Surat Pekeliling Ikhtisas Bil.4/2002 : Pelaksanaan program sekolah selamat. Kementerian Pendidikan Malaysia).

MOE Circular 8/2011. Management of pupils in schools. Ministry of Education (Surat Pekeliling Ikhtisas Bil. 8/2011. Pengurusan keselamatan murid di sekolah. Kementerian Pendidikan Malaysia).

MOE Circular 7/2011. Implementation of Standard Operating Procedure (SOP) 1:3:7: Reporting and action on pupil's discipline issues. Ministry of Education (Surat Pekeliling Ikhtisas Bil. 7/2011. Pelaksanaan "Standard Operating Procedure" (SOP) 1:3:7: Pelaporan dan tindakan isu disiplin murid. Kementerian Pendidikan Malaysia).

MOE Circular 6/1998. Taking care of student's health at school. Ministry of Education (Surat Pekeliling Ikhtisas Bil. 6/1998: Menjaga kesihatan pelajar di sekolah. Kementerian Pendidikan Malaysia).

MOE Circular No. 7/2000. Prevention of fire at schools. Ministry of Education (Surat Pekeliling Ikhtisas Bil.7/2000. Mencegah kebakaran di sekolah. Kementerian Pendidikan Malaysia).

MOE Circular No. 8/2009. Safety steps that should taken during after school activities or programs. Ministry of Education (Surat Pekeliling Ikhtisas Bil.8/2009. Langkah-langkah keselamatan semasa mengikuti aktiviti atau program lawatan di luar waktu Persekolahan. Kementerian Pendidikan Malaysia).

MOE Circular No. 10/2009. Implementation of road safety education program in primary schools in Bahasa language. Ministry of Education (Surat Pekeliling Ikhtisas Bil.10/2009. Pelaksanaan program pendidikan keselamatan jalan raya (PKJR) dalam Bahasa Malaysia di sekolah rendah. Kementerian Pendidikan Malaysia.

MOE School Secular No.8/1978: Fire drill guide for schools. Ministry of Education (Surat Pekeliling Ikhtisas Bil. 8/2078. Panduan latihan kawad kebakaran untuk sekolah. Kementerian Pendidikan Malaysia.

Morrongiello BA, McArthur BA, Spence JR. Understanding gender differences in childhood injuries: Examining longitudinal relations between parental reactions and boys' versus girls' injury-risk behav iors. Health psychology. 2016 Jun; 35(6):523. Retrieved from https://doi.org/10.1037/hea0000275 PMID: 26348496

MyHEALTH. Dengue fever portal (2017). Retrieved from .http://www.myhealth.gov.my/en/dengue-fever/ (Accessed 12 July 2017)

MS 1722:2011. *Occupational Safety and Health Management System* – Guidelines Department of Std. Malaysia. Retrieved from http://www.jsm.gov.my/ms-1722#.WXNqeYSGPIU

Nakitto M., Mutto M., Lett R. (2006). Environmental hazards and access to injury care at 20 primary schools in Kampala, Uganda : short research report. African Safety Promotion. Vol. 4, No. 3. Retrieved from https://hdl.handle.net/10520/EJC93044.

National SAFE KIDS Campaign (NSKC)(2004). School Injury Fact Sheet Washington (DC). Online available: http://www.safekids.org.

Nekoei Moghadam M., Shykhoeslami S., Rahimisadeq R., Khanjani N. (2012). Iranian Nursery School Teachers' Knowledge about Safety Measures in Earthquakes. *Al Ameen J. Med. Sci*. 2012:5(1):63-68

New Straits Times (2013). Lightning strikes 5 pupils. https://www.asiaone.com/News/AsiaOne%2BNews/Malaysia/Story/A1Story20130203-399760.html (Accessed 3.2.2013)

National Institute of Occupational Safety and Health Malaysia(NIOSH) (2003). OSH in School Programme (Buku panduan keselamatan dan kesihatan pekerjaan di sekolah). NIOSH pub.

Noraine S.H., Norlaile S.H., Azi A.J., Salsabila M. (2019). Educators' Preparedness towards Children Safety and Health in Malaysian Preschools and

Kindergartens. International Journal of Innovation, Creativity and Change.Vol. 10:8. www.ijicc.net

Norlen M, Wong S.V., Hizal Hanis H, Ilhamah O. (2011). An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy, MRR 03/2011, Kuala Lumpur: Malaysian Institute of Road Safety Research.

Norlia A., Sufean H.(2006). Dasar sekolah selamat: Tinjauan disatu zon bandaraya Kuala Lumpur. *Jurnal Pendidikan Universiti Malaya* 2006:27-36.

Nursyuhada M.Y., Vivien H., Ezza S.A., Khairudin O. (2019). The educators's perspective: knowledge, attitude and practice on occupational health and safety at school among primary and secondary school teachers. Malaysian Journal of Public Health Medicine 2019, Vol. 19 (1): 184-190. ISSN 1675-0306.

Nurul A.H, Tengku M.A (2009). Situational Analysis on Safety and Health in Primary School in Kota Bharu. *Journal of Community Health: Vol 15 Number 2.*

Occupational Safety and Health Act and Regulations, 1994. Act 514. MDC Pub. 2016 edi.

Occupational Safety and Health Administration (OSHA) of United States (2013). United States Department of Labor. Retrieved from http://www.osha.gov/pls/oshaweb/ owadisp.show_document?p_Table=STANDARDS&p_id=9793 (Accessed 23.6.2013)

Otsubo, S.M. (1988). A behavioral study of warning labels for consumer products: Perceived danger and use of pictographs. In Proceedings of the Human Factors Society 32nd Annual Meeting (pp. 536–540). Santa Monica, CA: Human Factors and Ergonomics Society.

OSH in School Programme (2008). Guide book on school occupational safety and health programme (Buku Panduan Program Keselamatan dan Kesihatan Pekerjaan di Sekolah). NIOSH Malaysia pub.

OSH in the school curriculum (2007). Requirements and activities in the EU Member States, European Agency for Safety and Health at Work, 2007 (page 15). https://osha.europa.eu/en/publications/osh-school-curriculum-requirements-and-activities-eu-member-states (Accessed 23.6.2013)

Pradhan P. (2016) A HIRARC model for safety and risk evaluation at a hydroelectric power generation plant. *International Journal of Engineering Researches and Management Studies*. Vol.3(6):June 2016.

Peden M., Oyegbite K., Ozanne-Smith J., Hyder A.A., Branche C., Rahman AKMF., Rivara R., Bartolomeos K. (2008). World Report on Child Injury Prevention. WHO, UNICEF. WHO Press, Switzerland.

Peltzer K., Pengpid S. (2015). Unintentional Injuries and Psychosocial Correlates among in-School Adolescents in Malaysia. Int. J. Environ. Res. Public Health 2015, 12, 14936-14947; doi:10.3390/ijerph121114936.

Perak State Government (2013). Official Portal https://www.perak.gov.my/ index.php/en/19-perak-gov. (Accessed 9.9.2013)

Perak State Health Department (2017). Retrieved from http;//jknperak.moh.gov.my (Accessed 3.7. 2017)

Pierce M.C., Bertocci G.E., Janosky J.E., Aguel F., Deemer E., Moreland M., Boal D.K.B., Garcia S., Herr S., Zuckerbraun N., Vogeley E. (2005). Femur Fractures Resulting From Stair Falls Among Children: An Injury Plausibility Model. *Pediatrics* 2005;115;1712.

Pilla S.D. (2010) Slip, Trip and Fall: A Practical Handbook. 2nd edi. CRC Press pub.

Pisaniello D.L., Stewart S.K., Jahan N., Pisaniello S.L., Winefield H., Braunack-Mayer A. (2013). The role of high schools in introductory occupational safety education – Teacher perspective on effectiveness. *Safety Science 55:53-61*.

Potts R., Swisher L. (1998) Effects of Televised Safety Models on Children's Risk Taking and Hazard Identification. *Journal of Pediatric Psychology, Vol. 23:No. 3:157-163*

Professional Training Services (PTS) by the Bureau of State Risk Management. State of Wisconsin(2011). Health and Safety Attitude Survey. Retrieved from www.doa.state.wi.us/docview.asp?docid=2617 (Accessed 8.1.2013).

Purdy G. (2010). Perspective: ISO 31000:2009 – Setting a New Standard for Risk Management. *Risk Analysis. Vol. 30, No.6:881-886*. Retrieved from http://www.broadleaf.com.au/pdfs/articles/art_riskanalysis_iso31000.pdf

Queensland Education Department (2013). Curriculum activity risk management guidelines. Retrieved from http://education.qld.gov.au/curriculum/carmg/ (cited 13.8.2013)

Ramli I. (2017). The goal is rusty and decayed (Accessed 10th April 2017) Retrieved from www.hmetro.com.my/node/151281

Rice V.J.B., Lueder R. (2008). *Designing products for children. Ergonomic for children: Designing Products and Places for Toddlers to Teen*. Taylor and Francis, London pub.

Rice V.J.B. (2013). Warnings for children. Work 44(2013):S19-S28. DOI 10.3233/WOR-121491. IOS Pres. Retrieved from https://www.researchgate.net/ publication/233930180.

Rimpau P. (2008). Injury risk and reduction practice Labuan. National Health and Morbidity Survey III (NHMS III) (2008). Free paper: Malaysian J. Public Health Medicine. V.8 (Sumplement 3) 2008.

Ridley J. (1986) Safety at Work, 2nd Edition. London: Butterworth Ltd.

Rogers, W. A., Lamson, N., & Rousseau, G. K. (2000). Warning research: An integrative perspective. Human Factors, 42, 102–139.

Roseveare C.A., Brown J.M., Mcintosh J.M.B., Chalmers D.J. (1999). An intervention to reduce playground equipment hazards. *Inj. Prev.* 1999;5:124-128.

Robutson C.(2007). Safety, Nutrition and Health in Early Education. 3rd edi. Thomson Delmar Learning pub. Pp59-72.

Rotich L.C., Kwasira J. (2015). Assessment of success factors in the implementation of occupational health and safety programs in tea firms in Kenya: A case o Kaisugu Tea Factory. *International Journal of Economics, Commerce and Management*. United Kingdom Vol. III, Issue 5, May 2015:797-812. Retrieved from http://ijecm.co.uk/ ISSN 2348 0386. Accessed 5.5.2017.

Royal Society for the Prevention of Accidents (RoSPA) (2012). Managing Safety In Schools & Colleges. Retrieved from www.rospa.com/schoolandcollegesafety/. Accessed 8.2.2016.

Rozanna L (2017). Malaysia identifies victims of religious school fire, amid outrage over safety. Reuter. Retrieved from https://www.reuters.com/article/us-malaysia-fire- idUSKCN1BQ0AI (Accessed 21 June 2021)

Sabu A.(2005). Pendidikan penyelian sekolah yang efektif. (Supervising education in school effectively). Jurnal Pengurusan dan Kepemimpinan Pendidikan, Institut Aminuddin Baki.. Vol.9:1:25-31.

Safe School Concept and Manual: Implementation Guide to Create a Safe School, Community and Family for Children (2002). 3rd edi. (2003). Ministry of Education. Nur Niaga Sdn. Bhd. pub.

Safety Signs and Signals (2015). Guidelines on regulation. The Health and Safety (Safety Signs and Signals). Guidance on Regulations 1996. 3rd edi. Crown copyright 2015.Retrieved from http://www.hse.gov.uk/pUbns/priced/l64.pdf

Safety Culture Survey: Questionnaire (2013). Retrieved from http://www.workcover. nsw.gov.au/formspublications/publications/Documents/safety_culture_survey _questionnaire_2291.pdf. Accessed 8.1.2013.

Sahin H., Erkal S. (2012). Behavior of students towards safety measures to prevent school accidents. *Journal of Society for development in new net environment in B & H.* HealthMED-Vol.6:No.6:1979-1986.

Salminen S., Kurenniemi M., Raback M., Markkula J., Lounamaa A. (2014). School environment and school injuries. Public Health Education and Promotion : Vol.1 (76): 5(2014). www.frontiersin.org. doi:10.3389/fpubh.2013.00076

Sambasivam, S.S.Karuppiah K, Subramaniam, K., Praveena, S.M, Abidin, E.Z. Potential safety risks in schools: Ensuring the safety of our precious ones. Ann Trop Med Public Health 2017;10:580-585

School Safety Standard (2013). Pelaksanaan Skor Piawaian Keselamatan Sekolah. Bahagian Pengurusan Sekolah Harian. Ministry of Education, Malaysia. Retrieved from http://www.moe.gov.my/bpsh/ (Accessed 31.5.2013).

School Safety Standard Manual. Manual Pengguna Sistem Penarafan Keselamatan Sekolah (SPKS). Modul Sekolah. Bahagian Pengurusan Maklumat, Kementerian Pelajaran Malaysia. http//apps.moe.gov.my/spks/Manual_pengguna/manual/Modul_Sekolah_281.

Sengel A., Gur K., Kilinc E. (2020). The Epidemiology of Students Injuries in a Private Primary School in Turkey from 2012 to 2018. Clin Exp Health Sci 2020; 10: 191-197. ISSN:2459-1459. DOI: 10.33808/clinexphealthsci.649682.

Shackman G. (2001). NYS DOH, Presented at Albany Chapter of American Statistical Association, March 24, 2001. Retrived from http://faculty.smu.edu/slstokes/stat6380/deff%20doc.pdf (Accessed July 2014)

Shearn P.(2006). Teaching practice in safety education: qualitative evidence. *Research papers in Education. Vol.21(3):335-359*. Taylor and Francis.

Shendell D.G., Jhaveri M., Nowakowski A.C., Cambell J.K., Marshall F.G., Kelly S.W. (2010). Incident surveillance in New Jersey career and technical education programs, 1999 to 2008: attributes, severity, and reported use of personal protective equipment. *American Association of Occupational Health Nurses J*.58(9):367-380.

Shorr D.J., Ezer N., Fisk A.D., Rogers W.A. (2009). Comprehension of warning symbols by younger and older adults: effects of visual degradation. *Proceedings of the Human Factors and Ergonomics Society 53rd Annual Meeting.* Pro.sagepub.com (Retrieve 9.6.2015)

Signlab Sdn. Bhd.(2015). Hazard Sign Type. http://www.signlab.com.my/hazard-signs-type-p/Page-2-20.html#dw_toppanelmain. (Retrieved (9.6.2015)

Silver, N. C., Leonard, D. C., Ponsi, K. A., & Wogalter, M. S. (1991). Warnings and purchase intentions for pest-control products. Forensic Reports, 4, 17–33.

Sleigh M.(2008). Aisle Marking Tape Safety Color Code. https://aislemarkingtape. indoff.com/ (Accessed 23.6.2013)

Somerkoski B. (2017). Green Cross: Application for analyzing School injuries. Finnish Journal of eHealth and eWelfare: 9(4).

Stranks, J. (2000). *The Handbook of Health and Safety Practice*. 5th Ed. London: Prentice Hall.

Ssekamanya S., Ismail K.., Badzis M., Abduludin D.S. (2016). Predictors of School Safety Awareness Among Malaysian Primary School Teachers. European Journal of Social Sciences Education and Research: Vol 6(1): 88- 93: Retrieved from https://www.researchgate.net/publication/318538353. DOI:10.26417/ejser.v6i1. p88-93

Stephens R.D. National School Safety Center. United States. (2013) http://www.schoolsafety.us/about-us/director-s-message. (Accessed 23.6.2013)

Sun Y.H., Yu I.T., Wong T., Zhang Y., Fan Y., Guo S. (2006). Unintentional injuries at school in China—Patterns and risk factors. Accident Analysis and Prevention 38: 208–214. doi:10.1016/j.aap.2005.09.010.

Syafique S. (2014). Student dies two days after being struck by lightening. Retrieved from https://www.astroawani.com/berita-malaysia/student-dies-two-days-after-being-struck-lightning-33145 (Assessed 3.4.2014)

Tabancali E., Bektas T. (2009). Student safety in primary schools: A sample of Buyukcekmece county. Procedia Social and Behavioral Sciences 1(1), 281-284 (2009). doi:10.1016/j.sbspro.2009.01.051

Tam C. M., Ivan W. H. Fung , Thomas C. L. Yeung & Karen C. F. Tung (2003). Relationship between construction safety signs and symbols recognition and characteristics of construction personnel. *Construction Management and Economics. 21:7, 745-753.*

Taufil M. M.T., Narizan A.R. (2015). Usage of education legislation related to negligence fault among the primary school teachers. Ministry of Education: literature review. Education Research Journal Vol.16 (2005). (Pemakaian perundangan pendidikan berkaitan kes kesalahan kecuaian terhadap guru-guru sekolah rendah. Kementerian Pendidikan Malaysia: satu kajian literatur. Jurnal Penyelidikan Pendidikan Jilid 16 (2015)).

Tie F.H. (2004). *Strategic tripartite alliance in establishing a safe school programme in Malaysia*. Chapter 12 (118-125). OECD pub.

Tie F.H. (2005). Awareness of issues related to rights of students. Jurnal Pendidikan Universiti Malaya (2005). https://www.researchgate.net/publication/240631814 (uploaded 7 February 2016).

Tokel A., Altinay Z., Altinay F., Dagli G. (2016). An Evaluation of Safety and Security of Primary Schools of Cyprus for Welfare of Society. *Anthropologist* J. 23(3): 437-453.

True, Richard A. (2020). Safety in the Educational Environment: Rural District Administrator Perceptions of School Safety in Northeast Tennessee Public

Schools. Electronic Theses and Dissertations. Paper 3839. Retrieved from https://dc.etsu.edu/etd/3839

Tureková I, Bagalová T (2018). Knowledge and Experiences of Safety and Health Occupation Risks among Students. iJEP – Vol. 8, No. 5, 2018. http://www.i-jep.org. https://doi.org/10.3991/ijep.v8i5.8981

Tureková I, Bagalová T, Makovická Osvaldová L. (2016). Analysis of safety and health awareness among primary students. Proceedings of ICERI2016 Conference 14th-16th November 2016, Seville, Spain. Retrieved from https://www.researchgate.net/publication/311362873

Uniform Building By Law (UBBL), 1984 (updated 1st November 2015). [G.N. 5178/85] ISBN: 967-89-1570-7. ILBS pub.

Vaquero M, Martinez P.A (2020). Occupational Safety and Health Training for Undergraduates Nursing Students: A Spanish Pilot. Int. J. Environ. Res. Public Health 2020, 17, 8381; doi:10.3390/ijerph17228381

Vicario A. D. (2012). Safety management in Catalonia's schools. Procedia-Social and Behavioral Science 46:3324-3328.

Wang A.H., Chi C.C. (2003). Effects of hazardous material symbol labelling and training on comprehension according to three types of educational specialization. *International Journal of Industrial Ergonomics* 31(2003):343-355.

Washburn K.M . (2018). Back to School: School Library Safety and Security Checklist. Retrieved from https://knowledgequest.aasl.org/back-to-school-school library-safety-and-security-checklist/.

Waterson P. Pilcher C., Evan (2012). Developing safety signs for children on board trains. *Applied Ergonomics*. 43 (1): 254-265.

Waterson P., Monk, A. (2014). The development of guidelines for the design and evaluation of warning signs for young children. *Applied Ergonomics*. 45 (2014): 1353-1361.

Watkins H. (2011). "*Potential safety hazards can be recognized by noticing Near Miss Accident*". Near Miss Accidents.

Williams T., Wetton N., Moon A.(1989). A way in: Five Key Areas of Health Education. HEA, London.

Wischlitzki E., Amler N., Hiller J., Drexler H. (2020). Psychosocial Risk Management in the Teaching Profession: A Systematic Review. Safety and Health at Work 11:4: 385-396 (2020). https://doi.org/10.1016/j.shaw.2020.09.007

Wolgalter M.S., Sojourner R.J. (2010). Comprehension and retention of safety pictorials. Ergonomics, Nov 2010. DOI: 10.1080/001401397188017.

Retrieved from https://www.researchgate.net/publication/40963270 (Accessed 23.3.2021)

Wogalter,M. S., Begley, P. B., Scancorelli, L. R., & Brelsford, J.W. (1997). Effectiveness of elevator service signs: Measurement of perceived understandability, willingness to comply, and behavior. *Applied Ergonomics*, 28, 181–187.

Wogalter M.S., Conzola V.C., Smith-Jackson T.L.(2002). Research-based guidelines for warning design and evaluation [Electronic version]. *Applied Ergonomics, 33:219-230.*

Wogalter, M. S., & Laughery, K. R. (2006). Warnings. In G. Salvendy (Ed.), Handbook of human factors and ergonomics (3rd ed., pp. 889–911). New York: Wiley.

Wogalter M.S., Laughery K.R., Mayhorn C.B.(2012). Warnings and hazard communcations in Handbook of Human Factors and Ergonomics (Chapter 29). In Salvendy G. (Eds). 4th edi. John Wiley & Sons. Inc. pub. New Jersey.

Wogalter, M. S., & Silver, N. C. (1995). Warning signal words: Connoted strength and understandability by children, elders, and non-native English speakers. *Ergonomics*, 38, 2188–2206.

Wogalter M.S.(2019). Forensic Human Factors & Ergonomics: Case Studies and Analyses. CRC Press/Taylor & Francis Group, © 2019, pp. 17–32.

Wong L.T., Lo K.C. (2007). Experimental study on visibility of exit signs in buildings [Electronic version]. *Building and Environment. 42:1836-1842.*

Workplace signage. *Industrial Technology Stage 6 Syllabus* © Board of Studies NSW (2008). Charles Sturt University. Retrieved from http://www.hsc.csu.edu.au/ind_tech/ind_study/3376/ signage.htm

Wuensch, Karl L. (2005). "What is a Likert Scale? and How Do You Pronounce 'Likert?'". East Carolina University. http://core.ecu.edu/psyc/wuenschk/StatHelp/Likert.htm

Xaba M. (2014). A holistic approach to safety and security at schools in South Africa. *Mediterranean J. of Social Sci*. Sept 2014:V5No.20: 1580-1589

Young, S. L. (1991). Increasing the noticeability of warnings: Effects of pictorial, color, signal icon, and border. In Proceedings of the Human Factors Society 35th Annual Meeting (pp. 580–584). Santa Monica, CA: Human Factors and Ergonomics Society.

Young, S. L., & Wogalter, M. S. (1990). Comprehension and memory of instruction manual warnings: Conspicuous print and pictorial icons. Human Factors, 32, 637–649.

Zamanian Z., Afshin A., Davoudiantalab A.H., Hashemi H. (2013). Comprehension of workplace safety signs: A case study in Shiraz industrial park. JOHE, Winter-spring 2013; 2 (1-2). DOI:10.18869/acadpub.johe.2.1.2.37.