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The Awareness Level among Primary School Science Teachers on The Importance of Science Laboratory Management

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Abstract

The goal of this research is to identify the awareness level among the primary school Science teachers on the importance of Science laboratory management. The targeted respondents are 116 primary school Science teachers from the Manjung district. The study used and instrument (*Soal Selidik Tahap Kesedaran Kepentingan Pengurusan Makmal Sains (STKKPMS)* that was used by Noordin & Othman (2017), to identify the awareness level of secondary school preservice teachers on Science laboratory management. Though the questionnaire is designed for secondary school teachers, but it had been adapted to primary school Science teachers' knowledge. The collected data was analyzed using the Statistical Package for Social Sciences (SPSS) version 25.0. The results support that primary school Science teachers have high level of understanding and knowledge in almost all the domains and subdomains tested in this study. Two main domains discussed are Science Laboratory Management and Science Laboratory Safety Management, where in the first domain, the highest mean is from teachers' awareness on maintenances and purchasing done for the Science laboratory. In Science Laboratory Safety Management, the highest mean contributor is on laboratory guidelines and the least would be on chemical handling.

Keyword: Science Laboratory Management, Science Laboratory Safety Management, Primary school Science Teachers, Awareness Level.

Introduction

The importance of Science and Technology education in Malaysia has indeed been recognized and acknowledged by many parties and given the upmost priority in the Malaysian Plan. Science education in primary schooling is also not exempted from undergoing changes to adapt to the country's future. Before 1979, primary school science education was introduced

as a subject aimed at students learning facts and concepts and fostering students' abilities in using facts and the Science process. The reform of the curriculum carried out is a step to strengthen the teaching of Science at the primary school level. The new curriculum, *Kurikulum Standard Sekolah Rendah* (KSSR) has been implemented in primary schools, with changes in terms of goals, objectives, and teaching strategies compared to the old curriculum. It emphasizes the mastery of thinking skills and scientific skills in addition to understanding the basic principles of Science as well as cultivating a scientific attitude and moral values. Teaching and learning strategies in the new curriculum have recommended an inquiry approach that emphasizes learning through experience. Such a strategy is in line with the nature of Science itself, which is a field of knowledge and a method of inquiry and problem solving.

Science teaching is a crucial component of education, as it equips students with the knowledge and skills necessary to understand and navigate the world around them. One effective approach to science teaching is through the use of experiments in the laboratory. Laboratory experiments provide students with hands-on experience, allowing them to actively engage in the scientific process and develop critical thinking skills and therefore have been found to have a major impact on science learning outcome. By conducting experiments in the laboratory, students can apply the theoretical concepts they learn in class to real-world situations. They can also make observations, collect data, analyse results, and draw conclusions, all of which are essential elements of scientific inquiry. The laboratory is a unique learning environment that allows students to manipulate variables, test hypotheses, and explore cause-and-effect relationships in a controlled setting. This type of experiential learning not only enhances understanding, but also fosters curiosity and a deeper appreciation for science.

They provide a hands-on experience that helps students develop a better understanding of scientific concepts and principles. In addition, working in the laboratory allows students to develop important skills such as critical thinking, problem-solving, data analysis, and teamwork (Sahrina et al., 2022). Overall, incorporating laboratory experiments in science teaching allows students to actively participate in the scientific process, deepen their understanding of concepts, and acquire practical skills that are applicable beyond the classroom. In conclusion, laboratory experiments play a pivotal role in science teaching and learning. They offer a unique environment for students to actively engage in the scientific process, fostering critical thinking, problem-solving, and teamwork skills. The hands-on experience gained from laboratory work not only enhances students' understanding of scientific concepts but also provides a platform for applying theoretical knowledge to real-world scenarios. Furthermore, laboratory experiences have a significant impact on science learning outcomes, contributing to a deeper appreciation of science.

Problem Statement

Unfortunately, many teacher preparation programs do not adequately train today's science teachers to deal with the safety challenges they might face in the science classroom (Gudyanga, 2020).This lack of training can result in a lack of awareness and understanding of lab safety among primary school science teachers. Consequently, there is a need to prioritize lab safety education and training for primary school science teachers since Ghiasvand et al. (2018) had stated that there are many deficiencies in safety measures in primary school science classrooms..

Lack of training among primary school science teachers will hinder the teachers' effort to apply scientific research practices in their classrooms. This will later dampen the

integration of lab safety protocols into their lesson plans and ensure that students are practicing safe behaviours in the laboratory. The awareness of primary school science teachers towards lab safety is a crucial aspect that needs to be addressed. This awareness can be improved through professional development programs and workshops that focus on lab safety best practices. Therefore, it is crucial for teacher preparation programs to incorporate comprehensive lab safety training to equip primary school science teachers with the knowledge and skills necessary to create a safe and secure learning environment in the science classroom.

Research Questions

Therefore, this study is being carried out to answer the following research questions.

a. What is the awareness level of primary school science teachers about the importance of science laboratory management?
b. What is the awareness level of primary school science teachers about the importance of science laboratory safety management?

Research Framework

The conceptual framework is a representation of the arrangement of the researcher's ideas from the beginning to the end of this study. Through this conceptual framework, it can explain the overall process that researchers want to do in studying the level of awareness of the importance of science laboratory management and safety among primary school science teachers. This level of awareness is measured through the level of knowledge about science laboratory management among those teachers. The dependent variable in this study is the level of awareness of primary school science teachers on the importance of science laboratory management. Meanwhile, the independent variable of the study is the understanding of the primary school science teachers on the management of the laboratory and the safety management of the particular science laboratory. This level of awareness identified is later classified into three parts namely High, Medium and Low.

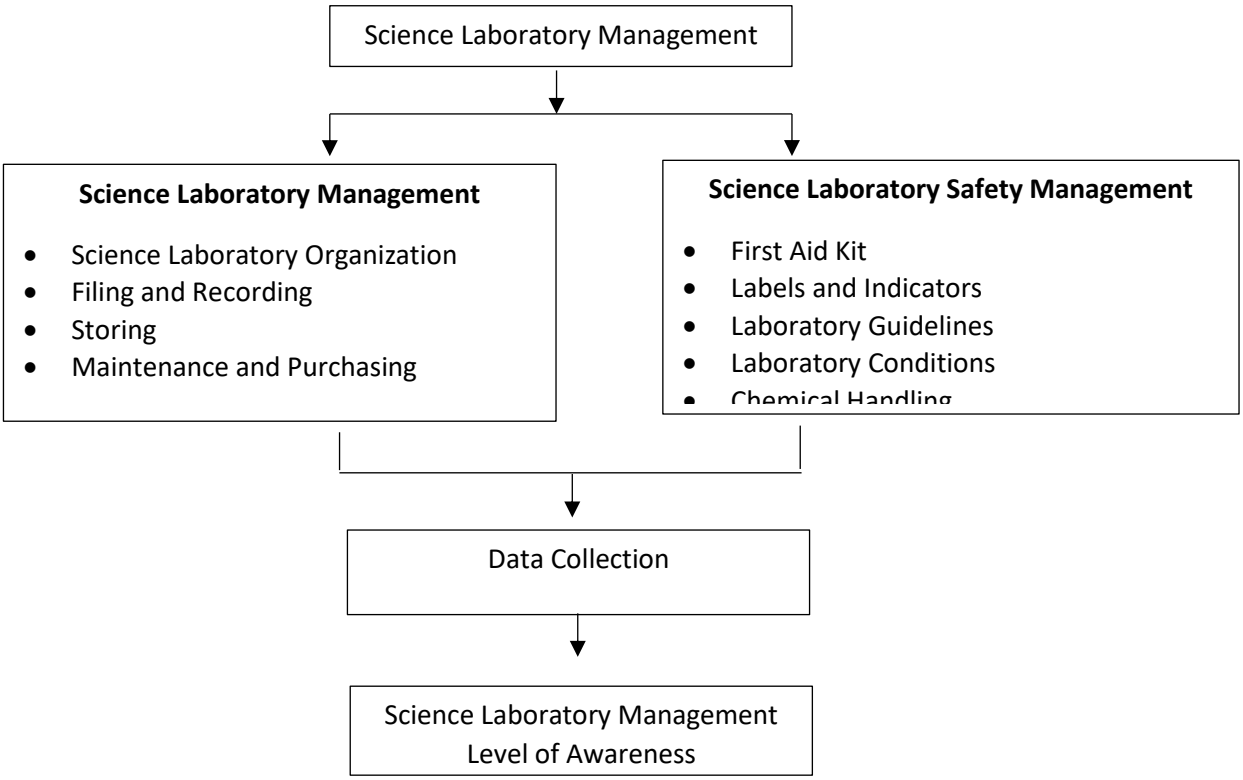

Figure 1: Research Framework

Literature Review

Science is a fun learning subject because it is not only limited to its context as a teaching medium about facts, theories, principles and laws of nature, but science is also a process which is the development of students' ability to generate science knowledge systematically and based on evidence and able to unravel every problem in science.

Malaysian Education Blueprint , PPPM, have explained in the third student aspiration, that students must be able to master thinking skills, cognitive skills such as reasoning, critical thinking, creativity and innovation. This will allow students who are knowledgeable and capable of achieving personal well-being by preparing them to contribute to the prosperity and harmony of their families, communities and country.

Students' interest and achievement in certain subjects will fluctuate throughout their schooling days as a relative trait according to the importance of factors that vary in their influence. One area of the curriculum where there is currently a particular concern is the subject of science and how students' interests and career aspirations related to science change throughout their schooling days (DeWitt et al., 2014). Science education centres on the work of teachers and the dilemmas involved in determining learning practices that will foster meaningful learning among the teachers (Lindsay, 2011).

In general, primary school teachers must determine how, when and where they must attend to the various demands of the explicit science curriculum while trying to balance teaching and learning needs across all curriculum areas (Smith & Fitzgerald, 2013). In the context of science subjects, the learning approach through practical work have been identified to have many advantages. Among them, the ability to encourage students' positive attitudes and effectively increase motivation in science learning (Okam & Zakari, 2017). As it is also agreed by Hinneh (2017) that practical work is vital in forming attitudes that will further

influence students' achievement in Science subject. Scientific experiments conducted during the learning process is important in forming attitudes that will further influence the students' achievement in the Science subject.

Student experimentation is an essential component of scientific education, allowing students to actively engage with the scientific process and develop important skills such as critical thinking, problem-solving, and data analysis. By conducting experiments, students are able to apply theoretical knowledge to real-world scenarios, collaborate with their peers, and develop a deeper understanding of scientific concepts. Furthermore, experimentation allows students to make observations, form hypotheses, design experiments, collect and analyse data, and draw conclusions. It is through these hands-on experiences that students can develop a strong foundation in scientific inquiry and become equipped with the skills necessary for future success in the scientific field and beyond.

To facilitate student-centred teaching using scientific experiments, it is important for educators to create a conducive learning environment that encourages curiosity, creativity, and independent thinking. Educators should provide students with opportunities to design their own experiments, allowing them to take ownership of their learning and foster a sense of autonomy. By implementing open-ended investigations, educators can promote critical thinking skills and foster a deeper understanding of scientific concepts. By incorporating student experimentation into the curriculum, educators can also promote interdisciplinary learning and help students understand the connections between different scientific disciplines.

Implementing teaching and learning activities that need to carried out in a science laboratory need teachers who are aware of laboratory safety. Laboratory safety is a critical aspect of scientific research and academic institutions (Thomsen & Borre-Gude, 2020).Teachers must have extensive knowledge and skill in laboratory safety to ensure the well-being of students and prevent accidents (Hill et al., 2019).

Safety measures in a science laboratory are essential to ensure the well-being of personnel, prevent accidents, and protect the environment. Some key safety measures in a science laboratory include providing proper training to personnel on handling hazardous materials, ensuring the availability and use of appropriate personal protective equipment, maintaining clear and visible safety signage throughout the laboratory, regularly inspecting and maintaining laboratory equipment to ensure it is in proper working condition, implementing safe storage and disposal procedures for chemicals and hazardous materials, and establishing emergency response protocols. Without adequate training and knowledge in laboratory safety, there is a higher risk of accidents and injuries occurring. Teachers' lack of knowledge and skill in laboratory safety can have serious consequences, including accidents and injuries occurring in the lab. Moreover, inadequate training can lead to a poor safety culture within the laboratory, further increasing the risk of accidents. It is essential to provide teachers with appropriate laboratory safety training early in their education and continue to promote safety awareness throughout their careers and for the students as well.

This knowledge includes understanding and following proper safety protocols, effectively communicating safety guidelines to students, and being able to handle potential hazards or emergencies in the laboratory. Without this expertise, students may be at risk of exposure to hazardous substances or unsafe working practices. Additionally, teachers with a strong understanding of laboratory safety can serve as role models for students, instilling in them the importance of following safety procedures and cultivating a positive safety culture (Mendoza et al., 2019).

This ultimately helps create a safer and more productive learning environment for students, where they can confidently engage in hands-on scientific experiments and research. Teachers' knowledge and skill in laboratory safety is crucial for maintaining a safe and accident-free learning environment (Mogopodi et al., 2015).In conclusion, the role of teachers in enforcing laboratory safety cannot be overstated. Their knowledge and skill in this area are essential for creating a safe and conducive learning environment for students.

By providing appropriate laboratory safety training to teachers early in their education and consistently promoting safety awareness throughout their careers, educational institutions can ensure that teachers have the necessary expertise to protect the well-being of their students and prevent accidents in the laboratory. This, in turn, allows students to engage in hands-on scientific experiments and research confidently, ultimately fostering a positive and productive learning environment. Thus, it circles back to the need of carrying out this study to identify the level of awareness among the teachers on science laboratory management and its safety management.

Methodology

This study was conducted in primary schools in Manjung district. There are 81 primary schools in this district. This study uses a survey method based on a questionnaire. The sample was selected using a stratified random sampling method involving 116 science teachers in the Manjung district. The instrument used here is *Soal Selidik Tahap Kesedaran Kepentingan Pengurusan Makmal Sains (STKKPMS)* by (Noordin & Othman, 2017). Although the questionnaire is for secondary school teachers, but based on the findings of related studies on the teaching problems of primary school teachers, most teaching components in secondary schools also exist in primary schools. Among the significant modifications made to the questionnaire to suit the situation in primary school is the content knowledge aspect which is changed from the secondary school level to the primary school level. The collected data was analyzed using the Statistical Package for Social Sciences (SPSS) version 25.0.

Pilot study had been carried out to identify the internal reliability of the instrument. Twenty teachers were involved in the pilot study. The instrument's internal reliability coefficient was measured using Cronbach's Alpha. The Alpha values generated from the constructs were more than 0.70. Hence, the instrument for the research has high internal consistency. The Cronbach Alpha value for the instrument after pilot study is 0.937. Part A of the instrument consists of information related to the background of the respondents. Part B contains question items that aim to measure the level of awareness of the importance of laboratory management among the primary school teachers. Part B is divided into B1 and B2. Part B1 contains 20 items related to science laboratory management while Part B2 contains 20 items related to science laboratory safety management. In total, there are 39 items in this instrument.

Descriptive analysis had been carried out to identify the primary school science teachers' awareness level regarding Science Laboratory Management. This study uses the mean score interpretation formulated by Mohd Najib (2003) to determine the level of teacher awareness on science laboratory management based on the mean score interpretation below.

Table 1
Interpretation of Mean Score

Mean Score Range	Interpretation
1.00 – 1.20	Very low
1.21 – 2.40	Low
2.41 – 3.60	Average
3.61 – 4.80	High
4.81 – 6.00	Very High

Research Findings

Respondents' Profile

This study was carried out by involving 120 primary school teachers from the district of Manjung, which has 81 primary schools. Teachers teaching Primary Science are selected as respondents for this study. Table 2 below shows the background analysis of respondents in terms of percentage and frequency.

Variables		Frequency	Percentage
Gender	Male	8	6.9
	Female	108	93.1
Age	21-30 years old	34	29.3
	31-40 years old	45	38.8
	41- 50 years old	19	16.4
	More than 50 years old	18	15.5
Academic Qualifications	SPM	0	0
	Diploma	6	5.2
	Bachelors' Degree	97	83.6
	Masters' Degree	12	10.3
	Others	1	0.9
Teaching Experiences	Less than 5 years	20	17.2
	6-10 years	61	52.6
	More than 10 years	35	30.2

Based on Table 2, there are 8 male teachers (6.9%) and 108 female teachers (93.1%) involved in this study. Looking at the respondents' age, it can be said that most of the teachers are from 31-40 years of age, 45 (38.8%) to be exact. Most teachers have Bachelors' Degree, 97 (83.6%) and 6-10 years of teaching experiences, 61 of them (52.6%).

Meanwhile Table 3 explains the mean and standard deviation of the independent variables that will has influence over teachers' awareness level of in laboratory safety management in summary and Table 4 explains the individual descriptive analysis of each item in the instrument that explains Science Laboratory Management. In Table 3, Science laboratory Management has 4 sub domains. Each sub domain has high mean value when compared to the Mean Interpretation Score. The sub domains are i. Science Laboratory Organisation ii. Filing and Recording iii. Storing iv. Maintenances and Purchasing. The Science Laboratory Safety Management has 5 sub domains where each one have recorded high mean value. The sub domains are i. First Aid Kit ii. Labels and Conductors iii. Laboratory Guidelines iv. Laboratory Conditions v. Chemical Handling

Table 3

Items	Mean	Std. Deviation	Interpretation
Science Laboratory Management			
Science Laboratory Organisation	4.1724	0.59861	High
Filing and Recording	4.1155	0.55041	High
Storing	4.1414	0.49999	High
Maintenances and Purchasing	4.1965	0.56104	High
Science Laboratory Safety Management			
First Aid Kit	4.2651	0.51681	High
Labels and Indicators	4.2673	0.51565	High
Laboratory Guidelines	4.3693	0.50854	High
Laboratory Conditions	4.2529	0.53507	High
Chemical Handling	4.2177	0.58628	High

By looking into each items in the domain of Science Laboratory Management, it is stated that sub domain Science Laboratory Organisation has 4 items and all of it has high mean value. Item O1 which discusses on teachers' knowledge and understanding in establishing a science laboratory management committee in schools and has the highest mean, M=4.3190,SD=0.59854. Highest number of teachers (54.3%) "Agree" to this statement and 38.8% of them Strongly Agree towards it as well. Item O2, that explains the individuals that has to be appointed in that particular committee. For this statement 55.2% of the teachers 'Agree' and 38.8% 'Totally Agree' that Headmasters/Headmistress, Head Of Subject and Science Teachers must be appointed in that committee. Item O3 discusses on the need of self-rating of the Science laboratory on a yearly basis. This item have recorded 70.7% of teachers, agreeing and 19.8% of teachers, totally agreeing to it. Item 04 which discusses on the need of Continuous Professional Development regarding the Safety of Science laboratory also has the highest number of teachers agreeing to it (70.7%) and 13.8%, totally agreeing to it and lowest mean M=3.9569,SD=0.62404.

In the sub domain of Filing and Recording there are a total of 5 items. Item P1, discusses on the need of files for documentation purposes for Science laboratory. It is clear that teachers (72.4%) of them agree towards the fact that Science laboratory management file is important for documentation. Item P1 has the lowest mean value, M=4.0157,SD=0.57248. Item P2 explains on the importance of having detailed information on Science teachers recorded and updated. A total of 70.7% of teachers agreed to this statement. The information regarding financial records and resources must be also updated and this has been discussed by Item P3. For this item, 68.1% of teachers have agreed. Item P4 discusses on the importance of understanding and keeping the circulars and important documents regarding Science Education and the management of the Science laboratory. Item P5 discusses on the importance of documenting every information on the materials and equipment used in the Science Laboratory. The most number of teachers (72.4%), agree to that statement. It also has the highest mean, M=4.2241, SD=0.47706.

Sub domain of Storage has a total of 3 items. Item S1, which discusses on the teachers knowledge on stock maintenance is important. This item has the highest mean value, M=4.2261,SD= 0.51403. For this item. 68.7% of teachers have agreed that it is important for teacher to know on maintaining the stocks in the laboratory. Item S3, that explains the awareness of teachers in knowing that scientific equipment and materials received and issued must be registered and recorded based on *Tatacara Pengurusan Aset Alih Kerajaan Bil 5, 2007*

and *Tatacara Pengurusan Stor Kerajaan, 2005,* has the lowest mean value , M=4.034, SD=0.51739. For this item, the highest number of teachers, 73.3% agree that they must know about the circular and the procedure. Item S2, discusses on the teachers' knowledge in the preparation of a stock register of scientific equipment and materials must be complete and systematic. 73.3% of teachers agree to this statement. Item S2 has a mean value of, M=4.1552, SD=0.46818.

Sub domain of Maintenance and Purchase has a total of 5 items altogether. The highest mean value is for Item G3, which discusses on the amount of Per Capita Grant (PCG) implemented by the school is adhering to the correct instructions and guidelines. The mean value is M=4.2500, SD=0.54174. For this item , highest number of teachers that agrees to it is 64.7%. Item G4 have recorded the lowest mean value, M=4.1034, SD=0.62386. This statement discusses on the importance of presenting the Per Capita Grant (PCG) accordingly to the committee. 62.9% of teachers have agreed to this statement., which is the highest. Item G1 discusses on the teachers knowledge on purchasing the science equipment and materials that must comply with *Arahan Perbendaharaan.* This item have recorded the highest number of teachers agreeing to it, which is 67.2%. Item G2 explains that the total Per Capita Grant implemented by the school should be according to the correct instructions and guidelines and 67.2% of the teachers have agreed to it. Meanwhile item G5 explains the importance of stating the total of Per Capita Grant as an agenda in the annual and monthly meeting conducted at schools. A total of 66.4% of the teachers have agreed to this statement.

Table 4
Descriptive analysis for Science Laboratory Management

Item	Frequency and Percentage					Mean	Std Deviation	Interpretation
	1	2	3	4	5			
Science Laboratory Organisation								
O1	0 (0)	0 (0)	8 (6.9)	63 (54.3)	45 (38.8)	4.3190	0.59854	High
O2	0 (0)	2 (1.7)	5 (4.3)	64 (55.2)	45 (38.8)	4.3103	0.63812	High
O3	0 (0)	0 (0)	11 (9.5)	82 (70.7)	23 (19.8)	4.1034	0.53372	High
O4	1 (0.9)	1 (0.9)	16 (13.8)	82 (70.7)	16 (13.8)	3.9569	0.62404	High
Filing and Recording								
P1	0 (0)	2 (1.7)	10 (8.6)	84 (72.4)	20 (17.2)	4.0517	0.57248	High
P2	0 (0)	1 (0.9)	12 (10.3)	82 (70.7)	21 (18.1)	4.0603	0.56397	High
P3	0 (0)	0 (0)	11 (11.95)	79 (68.1)	26 (22.4)	4.1293	0.55215	High
P4	0 (0)	1 (0.9)	11 (9.5)	78 (67.2)	26 (25)	4.1121	0.58639	High
P5	0 (0)	0 (0)	3 (2.6)	84 (72.4)	29 (25)	4.2241	0.47706	High

Storage								
S1	0 (0)	0 (0)	5 (4.3)	79 (68.7)	3(27)	4.2261	0.51403	High
S2	0 (0)	0 (0)	5 (4.3)	88 (75.9)	23 (19.8)	4.1552	0.46818	High
S3	0 (0)	0 (0)	13 (11.2)	85 (73.3)	18 (15.5)	4.0431	0.51739	High
Maintenances and Purchase								
G1	0 (0)	1 (0.9)	5 (4.3)	78 (67.2)	32 (27.6)	4.2155	0.55648	High
G2	0 (0)	0 (0)	4 (3.4)	80 (69)	32 (67.6)	4.2414	0.50425	High
G3	0 (0)	0 (0)	6 (5.2)	75 (64.7)	35 (30.2)	4.2500	0.54174	High
G4	0 (0)	1 (0.9)	14 (12.1)	73 (62.9)	28 (24.1)	4.1034	0.62386	High
G5	0 (0)	1 (0.9)	8 (6.9)	77 (66.4)	30 (25.9)	4.1724	0.57899	High

Another domain in this study is the Science Laboratory Safety Management. In this domain there are 5 subdomains. The first subdomain is First Aid Kit. It has 4 items. The item that has the highest mean is item M2, where it explores the teachers' knowledge on placing the first aid kit at the strategic places in the science laboratory to be obtained in case of accidents. Highest number of teachers (55.2%) agree that first aid kit is important in the Science laboratory. The least mean value is item M3, which discusses on the importance of having a record of accidents and mishaps happening around the Science Laboratory (*Buku Rekod Kemalangan)*. 65.5% of teachers agree to the statement that the placement of the first aid kit is important. Item M1, is about the teachers' knowledge that First Aid Kit must be complete and functional in the laboratory. 60.3% of teachers agree to this statement with mean value, M=4.3448, SD=0.52921. Item M4, explores the need for first aid procedures to be placed in the laboratory. Altogether 65.5% of teacher agrees to this statement.

The second subdomain, has only 2 items. The sub domain is Label and Indicators. Item L2 has the highest mean value, M=4.3017, SD=0.51448. It discusses on the importance of displaying the labels clearly for the students and other teachers using the laboratory. It has 64.7% of teachers agreeing to this statement. Item L1 explores on the teachers' understanding that warning signs and labels must be written where required. 68.1% of teachers agreed to this statement.

Laboratory guidelines is the third subdomain. It has 6 items. Item R2 and R3 have recorded the highest mean, M=4.4397, SD=0.49850. Item R2 explores the teachers' knowledge that Science Laboratory must be clean and neat, meanwhile, item R3 discusses on the importance of placing Fire Emergency Plan in Science Laboratory. For item R2, most teachers agrees to the statement above (56%). Item R3 has the highest number of teachers agreeing to it also (56%). Item R6 have recorded the lowest mean value, M=4.1466,

SD=0.56344. This statement discusses on teachers' knowledge in storing chemicals using the correct procedure. Most teachers agree on this statement (66.4%).

The fourth subdomain is Laboratory Condition. It also has 6 items altogether. Item K4 has the highest mean value, M=4.4483, SD=0.49947. It explores the importance of lighting and ventilation in the laboratory. According this item, 55.2% teachers agree to this statement. Item K2 has the lowest mean value, M=4.0259, SD=0.62500. This item discusses on the cleanliness aspect of the laboratory and it has to be checked regularly. 63.8% of teachers agree to this statement.

The subdomain of chemical handling has 4 items altogether. Item B2 has the lowest mean value, M=4.1638, SD=0.63168. This is explaining the importance of storing the corrosive and flammable materials in a safe place. 62.9% of teachers have agreed to this statement. Item B1 has the highest mean value, M=4.2500, SD=0.57294. This item discusses on the importance of keeping volatile liquids away from heat sources, sub and ignition sources. Around 63.8% of teachers agree to this statement.

Table 4
Descriptive analysis for Science Laboratory Safety Management

Item	Frequency and Percentage					Mean	Std Deviation	Interpretation
	1	2	3	4	5			
First Aid Kit								
M1	0 (0)	0 (0)	3(2.6)	70 (60.3)	43 (37.1)	4.3448	0.52921	High
M2	0 (0)		1(0.9)	64 (55.2)	51 (44)	4.4310	0.51456	High
M3	1 (0.9)	0 (0)	11 (9.5)	76 (65.5)	28 (24.1)	4.1207	0.63459	High
M4	1 (0.9)	0 (0)	16 (13.8)	76 (65.5)	30 (25.9)	4.1638	0.58894	High
Label and Indicators								
L1	0 (0)	0 (0)	5 (4.3)	79 (68.1)	32 (27.6)	4.2328	0.51681	High
L2	0 (0)	0 (0)	3 (2.6)	75 (64.7)	38 (32.8)	4.3017	0.51448	High
Laboratory Guidelines								
R1	0 (0)	0 (0)	0 (0)	72 (62.1)	44 (37.9)	4.3793	0.48732	High
R2	0 (0)	0 (0)	0 (0)	65 (56)	51 (44)	4.4397	0.49850	High
R3	0 (0)	0 (0)	0 (0)	65 (56)	51 (44)	4.4397	0.49850	High
R4	0 (0)	0 (0)	1 (0.9)	67 (57.8)	48 (41.4)	4.4052	0.51039	High
R5	0 (0)	0 (0)	0 (0)	69 (59.5)	47 (40.5)	4.4052	0.49306	High

R6	0 (0)	0 (0)	11 (9.5)	77 (66.4)	28 (24.1)	4.1466	0.56344	High
Laboratory Conditions								
K1	1 (0.9)	0 (0)	2 (1.7)	87 (75)	26 (22.4)	4.1810	0.53729	High
K2	1 (0.9)	0 (0)	18 (15.5)	74 (63.8)	23 (19.8)	4.0259	0.62500	High
K3	0 (0)	0 (0)	0 (0)	64 (55.2)	52 (44.8)	4.2069	0.53596	High
K4	0 (0)	0 (0)	0 (0)	64 (55.2)	52 (44.8)	4.4483	0.49947	High
K5	0 (0)	0 (0)	3 (2.6)	75 (64.7)	38 (32.8)	4.3017	0.51448	High
K6	0 (0)	0 (0)	1 (0.9)	73 (62.9)	42 (36.2)	4.3534	0.49790	High
Chemical Handling								
B1	0 (0)	1 (0.9)	5 (4.3)	74 (63.8)	36 (31)	4.2500	0.57294	High
B2	0 (0)	2 (1.7)	9 (7.8)	73 (62.9)	32 (27.6)	4.1638	0.63168	High
B3	0 (0)	1 (0.9)	4 (3.4)	77 (66.4)	34 (29.3)	4.2414	0.55358	High
B4	0 (0)	1 (0.9)	7 (6)	74 (63.8)	34 (29.3)	4.2155	0.58690	High

Discussion

Science Laboratory Management

The domain of Science Laboratory Management has four subdomains: i. Science laboratory organisation ii. Filing and Recording iii. Storage iv. Maintenances and Purchasing. All the subdomains contribute significantly to the management of the Science laboratory at primary schools. In order to manage a science laboratory, many aspects have to be looked into. A combination of organizational, safety and administrative tasks are involved. Effective management of the laboratory is important for the smooth operations of experiments and scientific learning, data collection and overall safety of teachers and students. Science laboratory organisation is essential for maintaining a productive and safe research environment and an overall meaningful learning experiences for the students. Proper organization contributes to workflow efficiency, safety, and overall effectiveness in learning and conducting Science experiments.

In sub domain 1, Science laboratory organization, the highest mean value discusses on the teachers' knowledge about forming a committee exclusively for organizing a science laboratory. This is because establishing a committee for it will be able to ensure the management effectiveness, safety and decision-making. The headmaster/headmistress, subject heads along with subject teachers must be appointed in that committee. The item that suggest continuous professional development related to the management of the Science laboratory has scored the lowest mean. This is due to the lack of understanding among teachers that professional development does not only involve in teaching and learning activities in the classroom, but also in managing the Science laboratory. This will allow

teachers to learn more on the skills to properly conduct scientific experiments and using the tools and apparatus efficiently.

Documentation regarding the management and organization of the Science laboratory is discussed in the second subdomain. By looking into this subdomain, it is clear that teachers know the importance of recording all the information and apparatus in the Science laboratory. An efficient documentation system is essential to keep records of all processes in place and documents always up to date. But not many are comfortable to prepare files and records for managing the laboratory itself. The files and records must be neat and always updated according to the latest circular on Science laboratory and Science Education.

Subdomain four discusses on storage. The data had shown that stock maintenance in the laboratory is most crucial in management of the Science laboratory. But many teachers are unaware that all the materials and equipment must be documented and registered under *Tatacara Pengurusan Aset Alih Kerajaan Bil 5 Tahun 2007* dan *Tatacara Pengurusan Stor Kerajaan* based on *Pekeliling Perbendaharaan Bil 5/2009.* Similarly, in subdomain 5, purchasing the scientific equipment must be purchased according to *Arahan Perbendaharaan* and *Surat Pekeliling Perbendaharaan* that take effect. This subdomain discusses mainly on the Per Capita Grant that was offered to school and being used accordingly. Most of the teachers know that the grant received must be announced to the Science teachers in the school. But unfortunately the habit of presenting the expenses report is less familiar among the teachers. The expense report also must be presented during the annual curriculum meeting.

Science Laboratory Safety Management

The second domain discusses on the safety management of the Science laboratory. The first subdomain is the presence of First Aid Kit in the laboratory. Most of the teachers acknowledge that the First Aid Kit must be put in the laboratory where it is reachable during any accidents that might happen in the laboratory. Many teachers are still unaware that first aid procedures' information must be placed in the Science laboratory also. Subdomain 2 discusses the importance of labelling the chemicals and equipment in the laboratory. Labelling laboratory tools is an essential part of laboratory safety management, as it helps to ensure safety, organization, and efficiency. Poorly labelled tools can lead to confusion, errors, accidents, and waste. labelling laboratory tools can help the teachers to identify the tool and its contents, source, owner, and expiration date; communicate the hazards and precautions associated with it; prevent cross-contamination, misidentification, and misuse; track its inventory, location, and status; as well as facilitate its disposal, cleaning, and maintenance.

The sub domain 3 in the safety management of the Science laboratory discusses the laboratory guidelines. Overall in this subdomain, most of the teachers agree that the Science laboratory must be in a neat and systematic condition. And not only that, Fire Escape Plan must be displayed in the laboratory at all time and visible. Subdomain 4 had discussed on the condition of the Science laboratory, where it involves the safety, functions of the building , furniture and equipment in it. This domains discusses on the cleanliness of the laboratory and furniture placing in it. The importance of keeping the record of using the laboratory is also explained here. Teachers are aware that for any learning or scientific experiments to be carried out, the lighting and aeration in the laboratory is important. The last sub domain explains on teachers' skills on handling the chemical in the laboratory. It explores on how well the teachers know that volatile liquids must be kept away from the sun or any source of heat and also keeping the corrosive liquid at a safe place. In conclusion, primary school Science teachers are aware of all the subdomains stated here though they are not well trained for it

as the secondary school teachers. Unlike the primary school Science Laboratories, the secondary school Science Laboratories are maintained by lab technicians who are well prepared with all the skills needed in laboratory management.

Conclusion

Science education can be taught effectively when the students are actively engaged in the learning process. Effective Science teaching makes connections between what students are learning in the classroom and real-world applications. Science topics taught will be more relevant and engaging for the students. Active and inquiry based learning happen through hands on activities, experiments and inquiry based projects. Experiments that are carried out during learning would allow students to make connections between what they are learning and the world around them.

Learning Science through exploration and conducting experiments enable the feelings of curiousness among the students and later develop a deep understanding which is the basis of the principles in Science education (KPM, 2010). Accordingly, a Science laboratory was created in primary and secondary schools, where Science lab is an important place and conducive for teachers and students to explore a concept by conducting experiments and this is equivalent with an inquiry-discovery approach emphasized in teaching and learning Science.

Unfortunately, Science lab is a risky place, where various dangerous chemicals can be found inside it. For example, toxic gas, smoke or liquid that can escape from its container when handled and can cause health problems such as poisoning, allergic and respiratory problems (Adane & Abeje, 2012). Safety issues that happens in the laboratory can happen because of various factors. It can be caused by negligence ignorance or lack of training and knowledge among the teachers.

For a long time, some teachers and students have remained at the perceptual level of the safety risks in the laboratory, while the concepts of standardized operation, safety first has not been formed in the laboratory. This will create a learning environment that teachers and students have not cultivated the habit of following procedures and guidelines in the laboratory. The realization on the importance of Science laboratory management and Science laboratory safety management is important to enable teachers to master “knowledge application ability, risk prevention ability and emergency handling ability”.

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