UNIVERSITI PUTRA MALAYSIA

STUDENT UNDERSTANDING OF SCIENCE PROCESS SKILLS IN THE IMPLEMENTATION OF PRIMARY SCIENCE CURRICULUM BASED ON CLASSROOM ASSESSMENT

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By

NURAINI BINTI ABU BAKAR

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

January 2022

DEDICATION

This thesis is dedicated to

My dear husband: Harun bin Puniran

My lovely kids: Nurussyifa' binti Harun (12 years old)
Muhammad Taufiq bin Harun (10 years old)
Nawrah Hana binti Harun (5 years old)
Umar Hakim bin Harun (18 month old)

My lovely mom and dad: Haji Abu Bakar bin Mahmud
Hajjah Zainab binti Ahmad

With love, respect and a bunch of memories
Indeed, we belong to Allah and indeed to Him we will return.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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January 2022

Chairman : Siti Salina binti Mustakim, PhD
Faculty : Educational Studies

To succeed in an increasingly technological and advanced world, children must be scientifically literate. Therefore, the science curriculum is designed to provide students with science knowledge so that they can become scientifically literate individuals. Scientific Process Skills (SPS) are required to find answers to problems or systematically make decisions. The SPS can be categorized into basic SPS and integrated SPS (Aydodu et al., 2012; Derilo, 2019; Joseph et al., 2017; Kızılaslan, 2019). Nevertheless, it has been found that the SPS achievement of primary school students remains unsatisfactory. Some of the science teachers show no willingness to teach SPS in class and some of them failed to include all twelve SPS during science lessons.

This study focuses on the understanding of students' SPS via the implementation of a science curriculum in elementary school based on classroom assessment. Data were gathered from six teachers and twelve fifth-grade students selected purposively. The triangulation for a qualitative method is employed and analysed using NVIVO 12 Plus software. Key thematic findings show how students developed their understanding of six basic SPS, six integrated SPS, and basic SPS from prior knowledge. Other themes related are students' favourite SPS topic that makes students show more interest in developing full comprehension of SPS learning. The study was able to gain some perceptions of the teachers about the students' achievement level in SPS, gathered from teacher's professional judgment during the classroom assessment. Some issues such as the method, criteria, teaching approach, and teachers' collaboration in assessing students SPS are explained and elaborated accordingly. All the identified themes were validated using Cohen's Kappa calculation.

It was found that pupils' understanding shows a moderate level for basic SPS and low level for integrated SPS. Some of the pupils having little misconception for certain skills such as making inference, while most of them having difficulties to understand and interpreted the integrated SPS. The dominant skill practised by pupils is observation skill, based on the most favourite, easiest and frequency of using SPS. These findings are supported by teachers view that find out the performance of some pupils is at moderate level for basic and integrated SPS. While the performance of the rest is still low and need guidance from teachers according to their cognitive learning level in science.

Besides that, the teacher's view for the pupil's SPS performance are balance considering the understanding of lower and higher achievement in science. The teachers agreed that both category of pupils has their strength and interest in mastering the SPS. Therefore, it is essential for teacher to use the suitable approach to trigger the pupils' interest and make the lesson meaningful. The findings also suggest that students need to be engaged in more hands-on activities with greater relevance to SPS. However, the research findings of the pupil's SPS understanding that infused in the classroom assessment has provide a lot of information to the pupil's insight learning and for the teachers to modify their instructions. Teachers will be better positioned to modify their instructional strategies and content emphasis to help optimise pupil learning as they become more aware of their pupils' desires, needs, strengths, and weaknesses. When the planning of the pupil's learning is well strategized, it will give a big impact to the successful implementation of primary science curriculum.

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

KEFAHAMAN KEMAHIRAN PROSES SAINS MURID DALAM PELAKSANAAN KURIKULUM SAINS SEKOLAH RENDAH BERDASARKAN PENTAKSIRAN BILIK DARJAH

Oleh

NURAINI BINTI ABU BAKAR

Januari 2022

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Untuk berjaya dalam dunia yang semakin maju dan berteknologi, kanak-kanak mestilah mempunyai literasi sains. Oleh itu, kurikulum sains telah direka untuk memberikan pengetahuan Sains kepada murid agar mereka menjadi individu yang berliterasi Sains. Kemahiran Proses Sains (KPS) diperlukan untuk mencari jawapan kepada sesuatu masalah atau membuat keputusan secara sistematik. KPS boleh dikategorikan kepada KPS asas dan bersepadu (Aydodu et al., 2012; Derilo, 2019; Joseph et al., 2017; Kızılaslan, 2019). Namun, didapati pencapaian KPS murid sekolah rendah masih kurang memuaskan. Sebilangan guru sains didapati tidak menunjukkan kesediaan untuk mengajar KPS di dalam kelas dan sebahagian lagi gagal menanamkan penggunaan kesemua dua belas KPS semasa pembelajaran sains.

Kajian ini berfokuskan pada perkembangan KPS murid melalui pelaksanaan kurikulum sains sekolah rendah berdasarkan penilaian bilik darjah. Data dikumpulkan daripada enam orang guru dan dua belas orang murid tahun lima yang dipilih secara spesifik. Kaedah triangulasi digunakan dalam kajian kualitatif ini dan datanya dianalisis menggunakan perisian NVIVO 12 Plus. Dapatan tema utama dalam kajian ini menunjukkan perkembangan pemahaman murid bagi enam KPS asas, enam KPS bersepadu, dan perkaitan KPS asas dengan pengetahuan sedia ada murid. Tema lain yang berkaitan adalah KPS yang paling digemari murid yang berupaya mengembangkan minat murid terhadap KPS dan seterusnya membantu meningkatkan pemahaman mereka. Kajian ini juga telah berpeluang mendapatkan persepsi daripada beberapa orang guru mengenai tahap pencapaian KPS murid berdasarkan pertimbangan profesional guru dalam pentaksiran bilik darjah. Beberapa isu seperti kaedah, kriteria, pendekatan pengajaran, dan kerjasama guru dalam menilai KPS murid telah dijelaskan dan dihuraikan dengan sewajarnya. Semua tema yang dikenal pasti ini disahkan menggunakan kaedah pengiraan Cohen Kappa.

Didapati pemahaman murid terhadap KPS menunjukkan tahap yang sederhana bagi KPS asas dan tahap yang rendah bagi KPS bersepadu. Sebahagian kecil murid menghadapi masalah miskonsepsi bagi sesetengah kemahiran seperti membuat inferens. Sementara itu, sebahagian besar murid menghadapi kesukaran untuk memahami dan menjelaskan KPS bersepadu. Kemahiran yang paling dominan digunakan oleh murid adalah kemahiran memerhati, berdasarkan tinjauan temu bual bagi kemahiran yang paling digemari, paling mudah dan paling kerap digunakan. Dapatan ini disokong oleh pendapat guru yang mengatakan pencapaian KPS murid bandar bagi kemahiran asas dan bersepadu adalah di tahap sederhana. Sementara pencapaian bagi murid yang lain masih lagi di tahap rendah berdasarkan tahap kognitif murid dalam pembelajaran sains.

Selain itu, pandangan guru bagi pencapaian KPS murid adalah seimbang dengan mengambil kira pemahaman murid yang berpencapaian tinggi dan rendah dalam subjek sains. Guru-guru bersetuju bahawa kedua-dua kategori murid ini mempunyai kekuatan dan minat yang tersendiri dalam menguasai KPS. Oleh itu, adalah penting bagi guru untuk menggunakan pendekatan yang sesuai bagi mencetuskan minat murid untuk belajar dan menjadikan pembelajaran itu bermakna. Dapatan ini juga mencadangkan murid perlulah dilibatkan dengan lebih banyak aktiviti 'hands-on' yang berkaitan dengan KPS. Bagaimanapun, dapatan kajian tentang pemahaman KPS murid yang diserapkan melalui pentaksiran bilik darjah, sebenarnya telah memberi banyak maklumat bagi meningkatkan kefahaman murid dan memudahkan guru mengubah suai pengajaran. Guru dapat merancang strategi pengajaran dengan lebih baik bagi mencapai hasil pembelajaran yang optimum apabila mereka mengetahui keperluan, keinginan, kekuatan dan kelemahan murid. Kejayaan pelaksanaan kurikulum sains rendah dapat dilihat apabila pembelajaran murid dirancang dengan baik.

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With the name of Allah the Most Compassionate and Most Merciful

I thank the Almighty Allah for His blessings and help to me throughout this wonderful journey of seeking knowledge. O Allah, I extend my gratitude appreciation to You because, with Your abundance of grace and mercy—You, too—have facilitated my journey to the end of this dissertation. Alhamdulillah, Almighty God, for the space and opportunity You have given to this weak servant of Yours. There is no power in me except with Your help, O Allah.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
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- this thesis has not been submitted previously or concurrently for any other degree at any institutions;
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Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

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LIST OF ABBREVIATIONS

SPS	Science Process Skills
PBD	Pentaksiran Bilik Darjah
KSSR	Kurikulum Standard Sekolah Rendah
DSKP	Dokumen Standard Kurikulum dan Pentaksiran
MOE	Ministry of Education Malaysia
PBS	Pentaksiran Berasaskan Sekolah
EPRD	Education Policy Research Division
FPSK	Falsafah Pendidikan Sains Kebangsaan
KBSR	Kurikulum Bersepadu Sekolah Rendah
KBSM	Kurikulum Bersepadu Sekolah Menengah
PPPM	Pelan Pembangunan Pendidikan Malaysia
TIMSS	Trend for International Mathematics and Science Studies
SBA	School Based Assessment
ZPD	Zone of Proximal Development
UPSR	Ujian Pentaksiran Sekolah Rendah

CHAPTER 1

INTRODUCTION

This chapter presents the introduction of the study. It covers the background of the study that includes: the implementation of primary Science curriculum, the importance of science process skills (SPS) in developing the science knowledge and the implementation and impact of classroom asessment known as '*Pentaksiran Bilik Darjah'* (PBD) in school. The discussion continues with the statement of the problems, objectives of the study, research questions, the purpose of the study, the significance of the study, the scope of the study, limitations of the study. This chapter ends with the conclusion of chapter one.

1.1 Introduction

The technology and scientific world play a role in development education. Scientific education is the foundation of the continuity sustainability and transformation (Iwasan D.Kejawa, 2017). As children grow up in an increasingly technologically and scientifically advanced world, they need to be scientifically literate to succeed. Science education at all levels should focus on creating a society where well-educated adults are equipped to bring scientific thinking to bear on issues that affect them as citizens (Marincola, 2006).

In line with the active Industrial Revolution 4.0 taking place worldwide requires all parties to act fast together with the rapid development in technology products and smarter automation systems. Science education plays a key role for the futures of societies. The capability of human capital that is scientific literacy based is the basic factor that acts as the catalyst for this revolution which drive towards the development of high technology products. Hence, changes in the education system need to be done with emphasis on science knowledge towards pupils starting from primary school.

Science education in primary schools was introduced to all pupils as early as year one based on the Standard –based Curriculum Primary School (*Kurikulum Standard Sekolah Rendah - KSSR*). This curriculum is designed to develop science literacy by providing science-based knowledge to pupils in order to become science-literate by understanding the concept of basic science that is happening all around and being able to follow science learning in primary level (Bahagian Pembangunan Kurikulum, 2017). The main focus in KSSR Science for primary schools scientific skills and thinking skills as the primary source of knowledge acquisition Science inquiry approach.

The content of the science curriculum restructured and improved to ensure pupils are provided with knowledge, skills and values relevant to current needs. The Science KSSR from Year 1 to Year 6 is based on six themes namely Inquiry into Science, Life Sciences, Physical Science, Materials Science, Earth and Space and Technology and Sustainable Life. Each theme is organized in this way, based on the tendency of the theme according to the desired science / skill field. The Science Inquiry Theme contains twelves SPS that pupils need to master that encourages creative, analytical and systematic thinking.

In KSSR Science, the SPS, which are also part of scientific skills, have been applied to pupils from the first year with only two basic skills. Then, the other SPS were introduced along with the increased age and level of achievements. Based on the Curriculum and Assessment Standard Documentation (DSKP) KSSR Science has stated that SPS are needed in order to find answers to problems or making decisions systematically (Bahagian Pembangunan Kurikulum, 2017). SPS are used by scientists to investigate problems, issues or questions related to science (Eng Tek Ong & Bibi Hazliana Mohd Hassan, 2014). If the performance level of pupils' SPS is balance together with the appropriate attitude and knowledge, it can ensure the ability of pupils to understand science more effectively.

1.2 Background of the Study

Acquiring SPS is considered as "learning how to learn" because children learn how to learn by thinking critically and using information creatively (Amnah et al., 2013). The children continue to learn when making discriminating observations, organizing and analysing facts or concepts, giving reasons for particular outcomes, evaluating and interpreting results, drawing justifiable conclusions and predicting what will happen if anything were to be changed. Therefore, to ensure the performance level of pupils' SPS, the Ministry of Education Malaysia (MOE) has applied SPS elements in the KSSR Science DSKP. This is in conformity with the national curriculum that emphasizes three key aspects of pupil achievement - knowledge, skills, and values.

SPS are developed along with facts, concepts, and principles of science. SPS is introduced to pupils as one of the topic in primary Science from Year one until Year six. It is put under the theme of 'Inquiry in Science'. In order to evaluate the performance level of pupil's in Science, there is a platform called Classroom Assessment or known as *Pentaksiran Bilik Darjah (PBD*) a continuous assessment set up by Curriculum Development Division. PBD is the tools provided for teachers to assist them in evaluating the level of pupil's understanding for each subject. The implementation of PBD is compulsory for every pupils. Classroom Assessment/ PBD is one of the components of School-Based Assessment (*Pentaksiran Berasaskan Sekolah; PBS*) introduced in 2011 involving the transformation of an examination-oriented assessment system to a more holistic assessment system, which can assess and measure the potential of pupils in terms of physical, emotional, spiritual, intellectual and social (Fakhri & M. Isa, 2016).

PBD is a key component of the teaching and learning process (T&L) as it strengthens pupil learning, improves the teaching of teachers and is able to provide valid information about what has been accomplished or achieved in a T&L process. Teachers determine pupils' achievement through their involvement and preparation during teaching and learning process. Teachers assess pupils throughout the school year and gradually monitor their progress. They record pupils' achievement and extent of progress at the end of the year (Daisy Rani Arulappen, 2013).

Since PBD is a part of curriculum component, implementation involves subjects. One of the subjects involved is Primary Science where the implementation is carried out at Level 1 involving Year 1, Year 2, and Year 3. At Level 2 involve in Year 4, Year 5, and Year 6.

1.3 Problem Statement

Based on previous studies, the performance level of SPS among primary pupils is still at an unsatisfactory level (Eng Tek Ong, & Bibi Hazliana Mohd Hassan 2014, Tilakaratne, & Ekanayake 2017). A Study by Ong Eng Tek et al. (2012) shows that Malaysian secondary pupils have not sufficiently acquired the SPS by the Malaysian Ministry of Education. The issue is getting worse when most of the science teachers do not show their readiness to deliver the SPS in the classroom. Science teachers should be aware of the importance of improving the pupils' SPS and positive attitudes toward science, because they are strong predictors of the pupils' achievement in science (Tilakaratne & Ekanayake, 2017).

Abdul Rahim and Saliza (2008) found that teachers are experiencing problems such as uncertainty in scoring based on evidence from practical work, too much skills to be assessed, lack of laboratory materials and equipment, burden of other tasks and too many pupils to be evaluated. Besides that, a study by Amnah et al. (2017) has found that teachers failed to inculcate all eleven SPS identified in the curriculum to be inculcated during the lesson. This situation happened because of teachers to plan the specific SPS that need to be inculcated during teaching and learning. All these factors can be the cause of the failure.

In addition, there are studies showing that pupils in Malaysia have low scientific attitudes, especially in critical thinking skills with less emphasis on SPS (Kamisah Osman et al., 2007; Mohamad & Ong, 2013). Many researchers have investigate SPS in science education internationally (Faruk, & Lu 2012, Zeidan, & Jayosi 2015, Ozgelen 2017, Murziqin et al. 2019, Cetinkaya, & Ozyurek 2019,) and in Malaysia (Abu Hassan bin Kassim, & Rohana bte Hussin 2003, Najib Ghafar, & Rauf Ibrahim 2011, Ong Eng Tek et al. 2012, Fazilah Razali, Othman Talib & Azraai Othman 2016).

According to Norazizah Abdul Rahman et al. (2019), children are able to achieve a few elements of SPS such as observing, predicting and making inferences as early as preschool. Surprisingly, some preschool children manage to apply some elements of the integrated SPS, which is supposed to be achieved at the higher level. Amnah et al. (2017), that primary pupils need to acquire all the elements of SPS because it serve as a scaffold to other cognitive skills such as logical thinking, reasoning and problem solving skills.

Furthermore, there is a close link between cognitive development and SPS. Ozgelen (2017), stated that some reasoning patterns of Piaget's formal stage can equally be considered SPS. Indeed, pupils at the concrete level can successfully implement basic SPS; pupils at the formal level can implement integrated SPS. In the formal operational stage, pupils use integrated SPS, including identification and control of variables, proportional thinking, probabilistic thinking, and correlational thinking. These skills can predict pupils 'achievements in science and mathematics (Ozgelen, 2017). Therefore, this finding has proved that SPS should be emphasized since primary school.

Considering the importance of pupils' SPS meaningful science learning, it is inevitable there is a need measuring performance level (Ong Eng Tek et al., 2012). From 2017, the Curriculum Development Division, MOE has decided to include the SPS as one of the topic in the primary science syllabus that must be teach to pupils. The implementation of Classroom Assessment known as PBD, which was introduced in 2011, provided a space for teachers to evaluate pupils' performance level continuously and systematically. Assessment can indicate what part of teachers' instruction needs rethinking and reworking. Appropriately used, classroom assessments have the potential to help both pupils and teachers to improve their classroom performance (Daisy Rani Arulappen 2013).

The aim of assessment for Science knowledge in the intended curriculum that includes the integration of SPS is to see pupil's understanding towards the content standard as holistically and as whole. Classroom assessment is one of the important components in primary science curriculum as it seeks to provide information on pupil development to teachers, parents, and pupils themselves. Assessment is vital because it reveal the pupil's overall performance that meets the objectives of the National Education Philosophy (FPK) in the effort to shape and develop glorious human capital (Fakhri & M. Isa, 2016).

There is evidence to suggest that despite the premium placed on investigating classroom assessment in teaching and learning in Malaysia, there is a lack of studies published on the development of SPS Malaysian pupils based on classroom assessment. Development of a skill is as an overall process whereby we look at the situation and process as the big picture and action towards the development involves deep planning and implementation. Besides that, there are findings showing that some teachers feel that they need to be exposed on how to assess SPS in class and how to make sure it is inculcated in a science class (Amnah et al., 2013). This gives the impression that exposure of pupil's SPS based on classroom assessment (PBD) is seldom been discussed.

Therefore, the problem statement for this study is that 'pupils have less emphasis and insufficient knowledge in mastering the SPS which lead to low understanding and achievement in science subject'. Thus, this study will focus on the understanding of pupil's SPS during and after the implementation of classroom assessment (PBD) inside or outside the classroom. This study is expected to contribute useful information that can be utilized by the relevant parties.

1.4 Purpose of the Study

The purpose of this study is to explore the understanding of pupil's SPS through the implementation of classroom assessment. The understanding of pupil's science process skill observed based on two groups of SPS; basic and integrated.

1.5 Research Objective

a. To explore the understanding of basic SPS among primary school pupils based on Classroom Assessment (PBD) skills: observe, classify, measure and use numbers, make inferences, predict, communicate,

b. To explore the understanding of integrated SPS among primary school pupils based on Classroom Assessment (PBD) in terms of skills: using space and time relationships, interpreting data, defining operations, controlling variables, making hypothesis and experimenting,

c. To identify which SPS are dominantly practised by pupils during teaching and learning Science.

d. To understand teacher's perception of the performance level of pupil SPS based on Classroom Assessment (PBD).

e. To understand the impact of SPS infused in Classroom Assessment towards the implementation of science curriculum.

1.6 Research Questions

a. To what extent are the performance of pupils for basic SPS that include 6 elements; observing, classifying, measuring and using numbers, making inferences, predicting and communicating, based on classroom assessment (PBD) done by teachers?

b. To what extent are the performance of pupils for integrated SPS that include 6 elements; using space and time relationships, interpreting data, defining operationally, controlling variables, making hypothesis and experimenting, based on PBD conducted by teachers?

c. Which SPS are dominantly practiced by pupils during the teaching and learning of Science?

d. What are teachers' perception of pupils' performance level in SPS based on Classroom Assessment (PBD)?

e. How does the infusion of SPS in the Classroom Assessment affect the successful implementation of science curriculum?

1.7 Significance of Study

SPS are important in science learning as become the driving wheel of discovery and development of facts and concepts. The pupils need SPS both when doing scientific investigations and during their learning process in order to the right science concepts (Harlen W., 1999; Lyle & Robinson, 2001). SPS is also believed to be able to ensure that pupils have meaningful learning experience because they help pupils to develop higher order thinking (Amnah et al., 2013).

Education system in Malaysia is going through reforms in an effort to improve quality of life. One of the aspects that emphasized was curriculum for assessment (Kementerian Pendidikan Malaysia, 2013). The new school-based assessment format which comprised school assessment, centralized assessment, psychometric assessment and co-curricular activity-based assessment has been implemented since 2011. Teachers given empowerment in assessing their pupils. Nonetheless, the empowerment also comes with the requirements of sufficient knowledge and skills in using various informal methods of testing. Therefore, teachers are urged to upgrade themselves with new knowledge and skills and practice professionalism in their career. There is a teacher-related issue, whereby the major challenge was the increase in workload for teachers. Thus, the research to PBD or classroom assessment burden the teachers, helps teachers to improve their pupils' achievement, especially in Science learning through understanding of SPS.

This study is significant because it will highlight every single step in understanding of SPS captured during and after implementation of classroom assessment. Since very little studies have been conducted in Malaysia regarding SPS through classroom assessment, research combine the teachers' perception about pupils' performance in acquiring SPS' assessment compared to their grades given.

1.7.1 Pupil

This study will benefit the pupils especially those who involved as the research participants to enhance their understandings SPS instructional practices Science. The dynamic change that happens in the classroom learning will help them to gain insight into how to develop their own learning. Apart from that, they will also have chances in applying SPS during hands-on activities and answering high order thinking skills science questions through the investigations. Thus, from constant reflection and revision of how SPS are being taught and performed, the pupils would uncover new insights about the process of learning.

The performance of pupils' SPS have a strong relationship with formal thinking abilities of middle and high school pupils (grade 7–12 pupils) (Tilakaratne & Ekanayake, 2017). Moreover, the Tilakaratne, & Ekanayake (2017) that basic SPS provide the intellectual groundwork in scientific inquiry. Therefore, by improving their SPS, these pupils will have potential to strengthen their mastery in Science.

Based on this study, the main focus of the assessment is to look at the pupil's overall performance that meets the goal of National Education Philosophy. Thus, the findings from this study will help pupils to improve their weaknesses in understandings and applying SPS.

1.7.2 Teacher

The result of the study is anticipated to teachers some useful information in improving their method and strategy on the teaching of SPS among primary school children. This study is also significant because it will reveal some findings related to teacher's planning, assembling, constructing, administering, scoring and appraising classroom assessment. Teachers can apply various assessment if they find out the current methods are not suitable for their pupils.

Furthermore, the findings of classroom assessment are important to teachers since it is quite new in our education system. Therefore, the information of the effectiveness in constructing classroom assessment will reflects their real practice. Apart from that, the outcome of the study will also for teachers to evaluate their own perception about classroom assessment and encourage them to compare their perception with the findings of the study.

1.7.3 Ministry of Education

The outcome of this study will reveal some details related to pupils' knowledge in acquiring SPS and teacher's competency teaching strategies in implementing classroom assessment. The findings on performance of pupil's SPS are important to the Ministry of Education as feedback in order to plan and strategize multiple methods of teaching and learning.

The implementation of classroom assessment or PBD requires a strong commitment from all parties, especially educators as implementers. The teacher's perception and review classroom assessment may give to Ministry of Education to conduct more training in pedagogical skill, competency skill, and appropriate classroom assessment method and assessment tools. If the support and cooperation provided by teachers is satisfactory, the success of the system may show a good result. Thus, teacher's perception the performance of pupil's SPS based on PBD can be adopted as one of the measures of effectiveness of the PBD system which is part of the PBS component.

1.8 The Scope and Limitation of Study

There are limitations that were identified in this study. This study is focusing on the practice of pupil SPS, which requires a close observation when teachers carrying out classroom assessments. However, the new policy set by the Education Policy Research Division (EPRD), has prohibited any form of observation toward pupils or teachers during the teaching and learning sessions in the classroom. As this study requires an observation process, therefore the time management for the purpose of data collection should be done after the formal learning time is over. This situation might affect the timetable observe teachers and pupils. Most of the pupils are bound to a solid daily schedule and limited transportation management. Thus, the diversity of pupil selections according to different levels of learning may be quite difficult to fulfil.

1.9 Definition of Terms

This will elaborate on terms and concepts that will be used for the study. The terms and concepts are related to SPS, classroom assessment, understanding of SPS and perceptions.

1.9.1 Science Process Skills

The conceptual definition of SPS are the thinking skills that scientist use to construct knowledge in order to solve problems and formulate results (Ozgelen, 2017). Tilakaratne, & Ekanayake (2017) say that SPS can be categorized into two, as basic SPS and integrated SPS.

In this study, SPS defined as twelve elements of SPS stated in Curriculum Standard and Assessment Document for Science subject which is learnt by pupils in primary school. The twelve SPS; observing, classifying, measuring and using numbers, making inference, predicting, communicating, using space time relationship, analysing data, defining operationally, controlling variables, making hypothesis and experimenting.

1.9.2 Primary Science Curriculum

Curriculum is defined conceptually as all learning that is organised and guided by the school, whether in groups or individually, within or outside the school (Kelly 1999).

In this study, primary science curriculum is a standard document designed to develop science literacy by providing a basic knowledge of science for pupils from year one to year six. It focuses on thoughtful learning involving scientific skills and thinking skills for the acquisition of knowledge through inquiry as the main approach in science

education. The curriculum is developed based on the three domains; knowledge, skills and values. The primary science curriculum is arranged thematically into six learning fields: Introduction to Science, Life Science, Physical Science, Material Science, Earth and Space Science, and Technology and Sustainability of Life (BPK, 2011).

1.9.3 Classroom Assessment

The conceptual definition of classroom assessment is the process of collecting, synthesizing and interpreting information to aid in classroom decision making. Throughout the school day, teachers continuously gathers and use information to make decision about classroom management, instruction, pupil learning and planning (Airasian & Russell, 2012).

In this study, classroom assessment is defined as all tests and assessment given by teachers to assess the year 5 pupil's SPS based on the primary science curriculum. The assessment instruments are fully organized by teachers and are reported in the form of performance level based on Curriculum Standard and Assessment Document for Science subject.

1.9.4 Understanding of SPS

The conceptual definition for the understanding of a science process skill is the overall process whereby we look at the situation and process as the big picture and action towards the understanding involves deep planning and implementation (Amnah et al., 2013). In this study, understanding viewed as each process of year 5 pupils acquired the SPS during classroom assessment with or without the teacher's guidance.

1.9.5 Perception

The conceptual definition of perception generally view or opinions held by an individual resulting from experience and external factors acting on the individual (Daisy Rani Arulappen, 2013). In this study, perception viewed as how science teachers perceive performance of pupils' SPS based on classroom assessment through their level of knowledge about classroom assessment.

1.10 Conclusion

This chapter discussed aspects such as background of study, statement of problem, research objectives, research question, hypothesis of the study, conceptual framework of the study, significance of the study, scope and limitations of the study and definition of terms. This chapter has focused on statement of problem where it highlighted weaknesses of pupils in master the SPS that lead to low understanding and achievement in science.

Based on the statement of problem, research objectives formulated with the hope to find out the strength and weaknesses of pupils' SPS in classroom assessment. Research questions are created to get a clear picture about understanding of pupils' SPS in Malaysian schools based on classroom assessment. This study hopes to be beneficial for teachers, pupils and educational authorities for better education and assessment in future.

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