SCIENCE TEACHERS' INFUSION OF PEER ASSESSMENT

IN PRIMARY SCHOOL

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ABSTRACT

Infusing peer assessment strategies into science lessons have the potential to enhance learner autonomy. Learner autonomy is an important attribute as an educational outcome. Nevertheless, research indicates that teachers do not infuse peer assessment strategies that teachers perceive as challenges. Thus, this study examines how primary science teachers infuse peer assessment strategies and to investigate the challenges these teachers face when infusing these strategies. The exploratory qualitative research design was utilized. The sample of this study were three primary school science teachers. These teachers were chosen because of their willingness to participate in the study. Data collection techniques employed were classroom observations and interview sessions. Four classroom observations were done for each teacher. The data was analysed using episodes based on the classroom discourse where there was indication of infusing peer assessment strategies. The challenges of infusing peer assessment were obtained from the interview data. This data was analysed using thematic analysis. The findings revealed that the three teachers' infusion of peer assessment strategies lies along a continuum. These infusion practices were labelled 'impressive', 'intermediate' and 'inferior'. In the 'impressive' category, teachers allowed students to ask their peers questions and provided a safe environment to do so. In contrast, the practices in the 'inferior' category showed teachers' classroom management as poor when they infused a certain kind of strategy. The teacher became the knowledge provider as teachers took over control without providing ample time for the student to immerse in the process. In the 'intermediate' category, the teachers did prepare resources to help students to mark their peer's work independently, but the teachers were unsure of how to facilitate the

process. The data obtained from the interview sessions elicited for four different challenges: Perceived pressure of time and work, Reluctance to change, Language proficiency and Routine and boredom. For example, the teachers did not believe that the infusion of peer assessment strategies could be sustainable because of the high demands of external examinations and stakeholders. Moreover, they claimed challenges such as non-active involvement from students, time constraints and wide syllabus may hamper the infusion of peer assessment strategies. The implication of this study is this study has highlighted the evidence of how much infusion of the peer assessment strategies are taking place in the classroom as well as the challenges teachers face in infusing these strategies. This should provide policy makers with relevant data when taking the next step in the school assessment reformation. Moreover, since peer assessment is a multifaceted enterprise, a more collaborative approach to infuse peer assessment strategies should be given priority. The move to effective peer assessment is not simple for teachers and students but is worthwhile and necessary for twenty-first-century learning.

INFUSI PENTAKSIRAN RAKAN SEBAYA OLEH GURU SAINS DI SEBUAH SEKOLAH RENDAH

ABSTRAK

Menginfusi strategi pentaksiran rakan sebaya ke dalam mata pelajaran sains mempunyai potensi untuk meningkatkan autonomi murid. Autonomi murid merupakan satu hasil pendidikan yang penting. Walau bagaimanapun, kajian lepas menunjukkan bahawa guru tidak menjalankan strategi pentaksiran rakan sebaya sekiranya guru memandangnya sebagai suatu cabaran. Oleh itu, kajian ini mengkaji bagaimana guru sains sekolah rendah menginfusikan strategi pentaksiran rakan sebaya dan untuk menyiasat cabaran yang dihadapi oleh guru tersebut ketika menerapkan strategi ini. Reka bentuk penyelidikan adalah kualitatif berasaskan penerokaan digunakan. Tiga guru sains menawarkan diri untuk menyertai kajian ini. Guru ini dipilih kerana kesediaan mereka untuk mengikuti kajian ini. Teknik pengumpulan data yang digunakan adalah pemerhatian bilik darjah dan sesi temu ramah. Empat pemerhatian bilik darjah dilakukan untuk setiap guru. Data dianalisis menggunakan episod berdasarkan wacana kelas di mana terdapat petunjuk bahawa guru telah berusaha untuk menginfusi strategi pentaksiran rakan sebaya. Cabaran untuk menginfusikan pentaksiran rakan sebaya diperoleh dari data wawancara. Data ini dianalisis menggunakan analisis tematik. Hasil kajian menunjukkan bahawa ketiga-tiga guru menginfusikan strategi pentaksiran rakan sebaya terletak di sepanjang kontinum. Amalan infusi ini dilabelkan '*impressive*', '*intermediate*' dan '*inferior*'. Dalam kategori '*impressive*', guru membenarkan pelajar mengemukakan soalan kepada rakan sebaya dan menyediakan persekitaran yang selamat untuk melakukannya. Sebaliknya, amalan dalam kategori '*inferior*' menunjukkan pengurusan bilik darjah guru lemah ketika mereka menerapkan strategi tersebut. Guru menjadi penyedia pengetahuan kerana guru mengambil alih kawalan tanpa memberi masa yang cukup untuk pelajar melibatkan diri

dalam proses tersebut. Dalam kategori '*intermediate*', para guru memang menyediakan sumber untuk membantu pelajar menandakan hasil kerja rakan sebayanya secara bebas, tetapi guru tidak begitu pasti bagaimana memudahcarakan prosesnya. Data yang diperoleh dari sesi temu ramah menghasilkan empat cabaran berbeza: Tekanan masa dan kerja, Keengganan berubah, Penguasaan bahasa dan Rutin dan kebosanan. Sebagai contoh, guru tidak percaya bahawa penyusunan strategi pentaksiran rakan sebaya adalah mampan kerana tekanan dari peperiksaan dan *stakeholders.* Lebih-lebih lagi, mereka mengaku cabaran seperti penglibatan pelajar yang tidak aktif, kekangan masa dan sukatan pelajaran yang luas dapat menghambat infusi strategi pentaksiran rakan sebaya. Implikasi dari kajian ini adalah bahawa kajian ini telah mengetengahkan bukti tentang penerapan strategi pentaksiran rakan sebaya yang berlaku di dalam kelas serta cabaran yang dihadapi oleh guru dalam menerapkan strategi ini. Ini harus memberikan data yang relevan kepada penggubal dasar ketika mengambil langkah seterusnya dalam reformasi penilaian sekolah. Lebih-lebih lagi, kerana pentaksiran rakan sebaya adalah aktiviti yang mempunyai pelbagai aspek, pendekatan yang lebih kolaboratif untuk menerapkan strategi pentaksiran rakan sebaya harus diberi keutamaan. Tindakan untuk melaksanakan strategi pentaksiran rakan sebaya yang berkesan tidak mudah untuk guru dan pelajar tetapi berbaloi dan perlu untuk pembelajaran abad ke-21.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Falchikov (2007) defined peer assessment (PA) as 'students to provide either feedback or grades (or both) to their peers on a product, process or performance, based on criteria of excellence for that product or event which students may have been involved in determining' (p. 132). The feedback provided by peers has been associated with positive outcomes of learning such as increasing student achievement, self-regulation, metacognitive processes and boosting motivation (Driscoll, 2000; Wang & Wu, 2008).

In implementing peer assessment in the classroom, teachers could use many activities such as asking peers to summarize information, critique peers' work, give and receive feedback, correct errors, question peers' thought processes and ask peers for rationale (Boud & Falchikov, 2006). As peers are involved in these activities, teachers are given the opportunity to know how much their students understood the content matter (Black & Wiliam, 1998; Brown & Harris, 2013). Moreover, peer assessment encourages a participatory culture of learning (Kollar & Fischer, 2010), enabling students to take control of their own learning and becoming autonomous learners (Wasson & Vold, 2011).

With all the positive outcomes of peer assessment, the infusion of this strategy in the classroom is still low among teachers (Rozi, 2013). The low infusion rate of peer assessment may be due to various reasons. Firstly, teachers would have to change their existing beliefs about teaching, learning and assessment (Black & Wiliam, 2009). Many teachers do not like to give up their control on assessment matters as they fear students may be dishonest or they lack expertise in giving proper feedback (Wanner

& Palmer, 2018; Noonan & Duncan, 2006). Secondly, teachers feel accountable about their students' learning and in a high-stake examination culture, teachers are required to provide accurate evaluation on student achievement to parents and school authorities (Kennedy, Chan, & Fok, 2011). Therefore, teachers may not see the value of these peer assessment strategies in the classroom.

While literature shows peer assessment generally improves learning, teachers are still hesitating to infuse these strategies. This study investigated how primary science teachers infuse peer assessment strategies in lessons and to see what challenges they faced when doing so.

1.2 Background of Study

Prior to 2011, in Malaysia, students have been assessed mainly through standardized tests developed by the Malaysian Examinations Syndicate (MES). These standardized tests included the Primary School Assessment or Ujian Penilaian Sekolah Rendah (UPSR) in Year 6, Lower Secondary School Evaluation or Penilaian Menengah Rendah (PMR) in Year 9, and Malaysian Certificate of Education or Sijil Pelajaran Malaysia (SPM) in Year 11. Therefore, examination orientation was a noticeable characteristic of the Malaysian education system. Summative assessment of students' learning that took the form of examinations and tests were typical ways of determining students' level of achievement and were essential to school accountability. In other words, all schools, teachers, students, and parents were striving for good grades and schools were held accountable for their pupils' examination results (Mohd Sofi, 2003).

Therefore, to move away from an exam-oriented assessment culture, continuous practical assessment or PEKA was introduced in 1999. This was considered as the first step in the use of formative assessment in science classrooms (Gurnam, Chan, & Sarjit, 2011). PEKA was expected to enhance students' practical

skills and to give a more holistic assessment of their scientific skills as teachers gave more constructive feedback (Ministry of Education Malaysia, 1999). However, the implementation afforded by the MOE failed in its aspiration. School-Based Assessment or Pentaksiran Berasaskan Sekolah (PBS) has gradually made its way into the Malaysian education system and is considered a catalyst for education reform. In tandem with the government initiatives to develop a decentralized and holistic assessment system, the Tenth Malaysia Plan (2011-2015) introduced the National Education Assessment System (NEAS) which is aligned with the new Primary School Standard Curriculum (KSSR) (Kementerian Pendidikan Malaysia, 2010).

The new assessment system is a combination of standardized tests and SBA. The academic and non-academic parts are the main components of the new assessment system in Malaysia. The academic part includes school assessment as well as central examination. School assessment is designed, produced, administered and graded by teachers in schools. Yet, these central examinations were developed by the MES and graded by teachers based on the rubrics provided by the MOE. The non-academic components are psychometric and co-curricular assessments as well as physical activity. Psychometric assessment measures students' innate knowledge and abilities. Also, students' participation in co-curricular and physical activities contributes to their overall assessment (Lembaga Peperiksaan Malaysia, 2011). At the time of this research, SBA was already in its fifth year of implementation.

SBA in Malaysia is conducted by class teacher during the learning and instruction process. It is a planned process and teachers implement it based on the standard document developed by the MOE. The Teacher Education Division of the MOE is formulating guidelines and policies to help teachers implement the new assessment system (Kementerian Pendidikan Malaysia, 2010). However, one main characteristic of this policy was a top-down approach.

1.3 Statement of Problem

Research has shown that peer assessment is useful in improving teachers' teaching (Pratt, 2000), yet teachers face numerous issues when they try to infuse peer assessment strategies into their daily lessons (Reinholz, 2015; Rozi, 2013). Teachers perceive that implementing peer assessment in their daily lessons would mean more work for them. In addition to preparing relevant materials for peer assessment activities and to get their students to talk in class, many teachers find it impossible when they held to complete the syllabus on time (Pandero, Brown & Courtney, 2014). Therefore, to avoid all this difficult work, teachers often place students in classroom situations where they have little opportunities to reap the benefits from interacting with others.

Primary school teachers rarely allow students to work together in small groups or with peers, because they are mindful of classroom management. Thus, teachers may create groups of students but still under the direction of the teacher, so the interactions among peers are limited. These practises of teachers are not considered as good peer assessment practices as students are unlikely to become autonomous learner (Gillies & Boyle, 2010).

Teachers are often reluctant to relinquish complete control over the feedback and assessment process, despite considerable evidence of deep student dissatisfaction with teacher-led feedback practices (Nicol, Thomson & Breslin, 2014). Teachers whom do not infuse peer assessment are actually denying their students the opportunity to foster open communication and engagement between teachers and students, promote cooperative investigation, problem-solving and reasoning, and provide students with an environment where they feel supported and emotionally secure (Johnson & Johnson, 2003; Roseth, Johnson, & Johnson, 2008).

In a high-stake examination culture, role of teacher becomes paramount and this diminishes the opportunities for peer learning through peer assessment (Spiller, 2012). In these cultural, learning is seen by students as a competitive and individual activity, the introduction of peer assessment strategies can be more difficult. Where students have developed prior strategies that work for them as individuals, it is likely that they will find adapting to peer assessment more difficult and uncomfortable and create or feel resistance towards it. However, many teachers are not efficient to show their students that peer assessment strategies do not diminish the importance of content matter but is a means to enable them to engage with the material more effectively.

In Malaysia, the implementation of school-based assessment was a top-down policy. As majority of the teachers were not involved in the development of the policy, many teachers are resistant to the changes that they face. Thus, teachers' current classroom practice in the Malaysian primary schools reveals that they only assess students' ability to accomplish tasks very much alike what they have taught previously (Faizah, 2011). Classroom discourse is teacher-centred, and teachers usually expect their students to give specific answers to questions they pose (Faizah, 2011). Students are not knowledge constructors and do not play an active role in the learning process. Apparently, this is not in line with the aims of the Malaysian new Primary School Standard Curriculum (KSSR) to use SBA to help learners construct knowledge and implement it into their daily life (Faizah, 2011).

1.4 Research Objectives

This research investigated teachers' infusion of peer assessment during science lessons. The objectives of this study were as follows:

1. To investigate the selected primary science teachers' infusion of peer assessment strategies in the classroom.

2. To identify the challenges faced by the selected primary science teachers when infusing peer assessment strategies in the classroom.

1.5 Research Questions

The following are the research questions of this research:

1. How are the selected primary science teachers' infusion of peer assessment strategies in the classroom?
2. What are the challenges faced by the selected primary science teachers when infusing peer assessment strategies in the classroom?

1.6 Significant of Study

This study, as any other qualitative study, did not plan to generalize the findings. The researcher was surprised to discover that teachers have various ways of infusing peer assessment strategies. Even though, from this study teachers' infusion of peer assessment was not ideal, however, there were instances where teachers made the effort to give autonomy to students, so that they could be involved in their learning. The teachers were able to embed these strategies without much resources, gives an idea that peer assessment strategies can be implemented if teachers are committed to the process. It is important to show teachers which of their practices are aligned with effective peer assessment strategies and which ones are not. By focusing and improving strategies that are aligned with peer assessment principles, teachers can increase their ability to use classroom techniques that elicit evidence of student learning minute to minute and day by day, identify and share learning expectations with students, provide and structure feedback that moves learning forward, and structure opportunities for students to take ownership of their own learning and to act as instructional resources for one another.

However, there are times teacher's infusion of peer assessment strategies can be inferior. The ill-mannered practices can create a situation where a lot of their students feel frustrated with their learning progression and their students are totally dependent on their teachers. These teachers subscribe to very traditional methods of teaching and this study can point out and make it explicit to teachers as they might not be aware of their practices.

The teachers would probably need courses, seminars and workshops that could make them aware of good practices of peer assessment and how to embed them in their daily lessons.

This study would also influence students as they will be able to show enhanced motivation and confidence, increase participation, and increase satisfaction with their work and demonstrate better organisation of their work. At the same time, evaluating peers' work can enhance the evaluators' own learning and self-confidence. Peer involvement personalizes the learning experiences, potentially motivating and continued learning.

Data regarding science teachers' infusion of peer assessment strategies would be important to educational programme developers and teacher educators, especially where the gaps are in terms of teachers' implementation of peer assessment. The data would provide valuable information on how to develop curriculum to engage pre-service teachers regarding assessment matters. Since assessment is an important component of the education system and with the move towards formative assessment, the knowledge on how to empower students in their learning is an important pedagogical skill.

From this study, the infusion of peer assessment have proven to be multi-dimensional and complex entity, reinforcing the need for policy makers to have more support when rolling out policies with regards to assessment. It would be better if policies are developed using bottom-up model.

1.7 Definition of Terms

i) Peer Assessment

Peer assessment is a process where students evaluate their peers' work and provide feedback through discussions and negotiations (Topping, 2009). The feedback students give can be in the written or verbal form. Any activities that teachers encourage students to give their opinions and ideas could be considered as peer assessment. In this research, peer assessment a collaborative learning technique, that science teacher encourages students to give ideas about their peers' work to improve the quality of the work through discussion.

ii) Infusion

The definition of infusion is the introduction of a new element into something. In this study, infusion means how teachers can plan and embed peer assessment strategies into their normal daily lesson. This means that teachers need not revamp their entire pedagogical skills but to embed these strategies where they feel it is relevant. For example, the teacher may ask students to mark their peers work and to provide feedback after consulting some resources. By infusing these strategies, teachers are empowering students to take ownership of their learning and to become autonomous learners.

1.8 Limitations of the Study

Limitations are the potential weaknesses of the research that are beyond the control of the researcher (Pajares, 2007). The data in this study was collected from only three teachers, thus it is important to emphasize that the researcher does not plan to generalize the findings. As the researcher planned to interview the teachers after each lesson, however, there were times when the teachers were busy and was not able to attend the interview immediately after the lesson. To ensure that the teachers still remember what they had practice, the researcher had written down the questions that she had planned to ask them. However, during the interview, the researcher discovered that many teachers did not look at the questions and at times forgot the actions that they had taken during the class. Nevertheless, the researcher asked these questions during the interview and probed as much as possible.

During interview to identify challenges that the teachers faced when implementing peer assessment, it is possible that the teachers may not be able to verbalize all their challenges or they might not want to disclosure all the challenges as they feel it might reflect badly on them.

1.9 Chapter Summary

This chapter describes the foundation for this study, namely the problem statement, the objectives and research questions, the significance of the study as well as the terms used. The following chapter contains the literature review on peer assessment, the benefits of peer assessment on student learning and the challenges in implementing peer assessment. The chapter also discusses the conceptual and theoretical framework.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This study investigates how selected primary science teachers infuse peer assessment into their daily lessons. This study was conducted after the assessment system had undergone a reformation. This study plans to see how teachers do infuse peer assessment strategies in their classrooms and what are challenges that they face when doing so.

This chapter begins with a brief description of what is peer assessment which leads into a discussion of studies that show the benefits of peer assessment in science learning and the potential challenges that teachers face when infusing peer assessment into their daily lessons. The subsequent section presents how educational reformations effect changes in teachers' behaviour. Review of past methodologies on peer assessment follows. The chapter ends with the discussion of the theoretical framework and conceptual framework are discussed.

2.2 What is Peer Assessment?

Historically, the definition of peer assessment as given by O'Donnell and Topping (1998) was "an arrangement for learners to consider and specify the level, value, or quality of a product or performance of other equal-status learners". Products that were assessed by peers included writing, oral presentations, portfolios, test performance, or other skilled behaviours. This definition was limiting because it meant that students were providing a grade without any elaborative feedback.

Recently, researchers have found that the feedback component is considered pivotal in the peer assessment process (Greenstein, 2010). This elaborated feedback done through discussions and negotiations is the heart of peer assessment which could lead to more learning by both students (assessor and assessee). Thus, a more recent and upgraded definition of peer assessment established Topping (2017) as "an arrangement for learners to consider and specify the level, value, or quality of a product or performance of other equal-status learners, then learn further by giving elaborated feedback and discussing their judgements with peers to achieve a negotiated agreed outcome". In this definition, the process of feedback is given priority. Feedback provided by peers can be in the form of verbal or written. However, Kollar and Fischer (2010, p. 345) had mentioned that it would be more effective if peer assessment took place as a dialogue stating 'interactive exchange may be beneficial' for learning.

Other researchers considered peer assessment as one of the strategies of formative assessment. Peer assessment involves students using peers as resources of learning and then evaluating their own learning (Panadero, 2016). In other words, peer assessment is an arrangement when students make assessment decisions about their peers' work. As students make decisions about their peers' work, the come to see what is considered good and what is not working well. Thus, peer assessment is considered a reflective practice that help students to regulate their learning, increase their motivation and become autonomous learners (Brown, 2017).

2.3 Benefits of Infusing Peer Assessment in the Classroom

Why should teachers infuse peer assessment into their daily lessons? In attempt to move to more student-centred learning, new assessment practices based on students and teachers becoming 'responsible partners in learning and assessment' (p. 3) are developed (Boud 2013b). There is strong evidence in the literature that self and peer-

assessment can enhance student learning and develop key capabilities in students, such as taking more responsibility for their own learning (moving from a passive to a more active learner); developing a better understanding of the subject matter, assessment criteria and their own values and judgements; and developing critical reflection skills (Boud 2013b; Falchikov 2013; Thomas, Martin, and Pleasants 2011).

The goal is that students help each other through their feedback and make judgements about their own work and the work of others using pre-determined criteria of quality. Students generally have a good understanding of one another and peer assessments allow them to work together while determining each other's areas of mastery and weakness. By doing so, they discover ways to overcome their obstacles and address deficiencies in ways that work best for them, instead of through prescribed interventions provided by a teacher. Because students speak the same "language," they tend to listen and take feedback from their peers. This type of assessment might be in the form of discussion boards, online chats, swapping papers or even a face-to-face conversation in class.

When teachers practice peer assessment, they help to promote the development of generic skills like working cooperatively, thinking critically. You can use it to promote and provide evidence of the development of generic skills and attributes:

- working cooperatively
- thinking critically
- giving constructive feedback
- learning from critical appraisal received from others
- managing one's own learning autonomously
- developing interpersonal skills and
- developing an awareness of group dynamics.

With more emphasis on students peer assessment at all levels have shown to engage and empower students, to develop reflective skills like self-regulation and metacognition, able to boost student communication skills, and preparing them to be autonomous learners (Andrade, 2010; Andrade & Valtcheva, 2009; Black & Wiliam, 1998; Brown & Harris, 2013; Boud & Falchikov, 2007) Peer assessment also allows students to use each other as support and resources for learning and actively engaging students in their learning (Wiliam, 2011).

One of the few studies that draws attention to the 'how students may benefit' perspective of peer assessment was conducted by Davies (2000). He observed that the peer assessment process had a different impact on students of diverse achievement levels. Specifically, comparison of pre and post-test scores suggested that high-achieving students may have benefited least from their peer assessment activities while low-achieving students statistically benefited most. A much different study that suggested a possible impact of peer assessment on student learning was conducted by Li and Steckelberg (2004), based on this finding, the researchers said that the learning gains of peer assessment may vary for students at different learning levels.

Another latest research shows peer-assessment and video comment-sharing are effective learning strategies for students to receive feedback on their learning. Researchers have emphasized the need for well-designed peer involvement in order to improve students' abilities in the cognitive and affective domains. Although student perceptions of peer-assessment have been studied extensively in higher education, few studies have focused on the effects of the peer-assessment strategy on students' performance from the affective perspective (Kuo, 2017). The concept of mobile learning was proposed by Traxler (2007), with an emphasis on learners employing mobile devices to be connected to real-world teaching environments. Nowadays, with

the popularity of mobile technology and wireless communications, mobile devices have been widely adopted in teaching activities to provide learners with more effective and convenient learning approaches.

In recent years, online peer assessment has become an increasingly common topic in teaching practice. Tseng and Tsai (2007) indicated that evaluations made through online peer assessment in web-based systems have the features of anonymity and immediacy of feedback. Meanwhile, students' learning portfolios can be recorded to observe their learning achievement, processes and progress. These learning portfolios can be accessible on the Internet without restraints of time and place, and the learners can obtain immediate feedback once the assessment has been made (Blackboard, 2011). For example, in a study of teachers developing educational research projects, Chen and Tsai (2009) found that learning activities fostered by online peer assessment helped maintain the quality of educational research projects developed by teachers and even increased the teachers' learning effectiveness. Based on the studies above, it is known that the combination of mobile devices and peer assessment contributed to better arrangement of the evaluation procedure and more efficient time management. The results suggested that the system helped increase the learners' critical thinking and learning achievement. In the meantime, many researchers have employed innovative learning models in education, which facilitate learning built upon interactions, and promote learners' self-efficacy, reflective ability, skills and learning attitudes.

Being involved in peer assessment may raise self-confidence and empathy for others. Moreover, for students providing and receiving feedback, it may improve a range of social and communication skills such as learning to give and accept criticism, negotiation and verbal communication skills, assessing suggestions objectively, being

diplomatic, or justifying one's position (Topping et al. 2000). Research by Meusen-Beekman et al. (2016) has shown that the introduction of peer assessment in primary education (as well as the introduction of self-assessment) results in long-term improvement of students' self-regulation skills.

Looking at the alternative feedback aspects that are listed in a study (Leenknecht, M.J.M., Prins, F.J.Y,2017)) students in primary education, but likely also in secondary and higher education, should abandon judgmental words and turn to the use of questions, advice, prescriptions, explanations, and examples during feedback exchange. These would give the learner plenty of information about where and how to go to. Being involved in good quality peer feedback in primary education may even have long term effects on students' self-regulation and motivation in secondary education (Meusen-Beekman et al. 2016) and should, thus, be encouraged. Effective support of all three subskills seems necessary to reach effective peer assessments.

There is ample evidence of the benefits for students' learning when peer assessment principles are infused. However, teachers play a critical role in the infusion of these strategies.

2.4 Teachers' roles in infusing Peer Assessment

Teachers who plan to infuse peer assessment strategies in their classroom may have to explicitly encourage students to talk to one another. Teachers must provide students with relevant tools so that they are able to give positive and constructive feedback. For example, a teacher may prepare a rubric with the criteria and descriptors and students can use this to provide the feedback. In the absence of the rubric, students may not be able to give constructive feedback. Students may give generic comments that would not help their peers to move forward with their learning. The role of a teacher that plan to infuse peer assessment is to prepare relevant materials and tools to ensure success.

Any form of assessment is laden with value and emotions for students and teachers alike (Brown, 2013). Thus, teachers' role in infusing peer assessment is to create a safe, stimulating and neutral learning environment (Brown, 2016). Teachers who intend to implement peer assessment strategies ought to develop a culture of classroom assessment that supports sharing ideas beyond individual differences (Harris & Brown, 2013). When students are involved in peer assessment activities, they might not feel comfortable to provide negative feedback to their peers who are also their friends. The students would then provide bias peer feedback resulting in unfair practices or even unwilling to participate (Raes, Vanderhoven, & Schellens, 2013). Thus, teachers who show empathy to students' emotions about peer assessment and are concern about these emotions would be better equipped to infuse peer assessment strategies into their daily lessons (Crossman, 2007). Teachers who support and respond positively to students' utterances can create stimulating classroom discourse and enhance dialogues among peers.

The use of peer assessment is often criticized because many students have a lack of (feelings of) ability to assess each other, and therefore, the quality of the peer feedback is often quite low (e.g. Prins et al. 2006; Tillema et al. 2011). Critical voices (Ballantyne et al. 2002) note that by 'giving' assessment 'away' to students' the mechanism that teachers use to influence students' learning processes is handed over. Proponents (Sluijsmans 2008; Topping 2009) however note that being an assessor promotes cognitive skills and gives students insight in (and commitment to) assessment standards and criteria.

Peer assessment is a strong vehicle of 'assessment for learning' because it actively involves students in evaluating their learning and allows them to participate in collaborative appraisal through the use of multiple perspectives when incorporating

viewpoints from peers (Panadero, 2016). There is ample evidence as to the benefits for students' learning when peer assessment principles are implemented. However, teachers play a critical role in the infusion of intended procedures. Teachers find students' interpersonal perceptions can influence their learning from PA (Cowie & Harrison, 2016). For example, students may experience pressure due to friendships with peers, resulting in unfair PA or refusal to participate (Raes, Vanderhoven, & Schellens, 2013).

As a consequence, there is a need not only to explore this phenomenon on a larger scale, but also to obtain an insight into teachers' levels of awareness regarding their students' understandings of the interpersonal process within PA. The teacher's perspective and actions are critical in developing a culture of classroom assessment that supports sharing ideas beyond individual differences (Cowie & Harrison, 2016; Harris & Brown, 2013).

Studying teachers' conceptions of PA is important at a time when the innovation of assessment practices is on the educational agenda (Brown & Harris, 2016), as we know from previous research that conceptions predict their classroom practices (Panadero & Brown, 2017). Besides that affective threats are aggravated when teachers are not fully aware of students' emotional reactions to PA (Higgins, Hartley, & Skelton, 2001).

Positive teacher responses, such as showing empathy to students' emotions about peer assessment (Crossman, 2007) and insight into students' emotional concerns, are therefore needed. Currently, however, little is known about teachers' awareness of students' concerns about the interpersonal dynamics in PA, including the lack of instruments on how to measure this.

Evidence from the individual studies indicated that the following features allowed the flexibility which was necessary to address teachers' individual starting points and learning needs: activities that created insights into and enabled exploration of teachers' beliefs and current practice were cited as important in eleven studies; observation and feedback (nine studies) enabled coaches or mentors to understand 'where teachers were coming from'; action research programmes (five studies), involving teachers in collaborative discussions based on the research questions and processes ensured that teachers were able to start at a level of enquiry they felt comfortable with and took on new areas of enquiry as they felt able; and establishing more than one learning cycle was cited in three studies as enabling teachers to build on what they knew and could do already (Cordingly, 2003).

There is ample empirical evidence as to the benefits for students' learning when AfL principles are infused. However, teachers play a critical role in mediating the inplementation of intended policies. Hence, their experiences, beliefs, and attitudes towards PA are important factors in determining whether the policy is actually carried out. A survey (Brown. 2015) of over 1500 primary, secondary, and higher education teachers in Spain elicited their beliefs and values around PA as well as other aspects of formative assessment; only 751 teachers provided complete responses to all PA items. Teachers reported occasional use of PA in their classrooms but with positive experience of it. The vast majority did not use anonymous forms of PA and half of the teachers considered the students were accurate when assessing peers. Confirmatory factor analysis and structural equation modeling were used to examine relationships of attitudes and beliefs to self-reported frequency of using of PA. The self-reported frequency of using PA was strongly predicted by teacher experience of PA which included positive reasons for using PA, rather than negative obstacles for avoiding,

prior use, and beliefs that students should participate in assessment, and willingness to include PA in grading.

Teachers could be facilitators to help students develop coping skills and self-management skills. Teachers must help students to recognize progress and these skills can lead to lifelong learning. Thus, understanding the reasons and experiences teachers use to implement a specific assessment practice will provide insights to both policy and professional development processes that ought to respond to the actual beliefs teachers have. Examination of these reasons in a new cultural context will also shed light on the degree to which previous studies can be generalized.

2.5 Challenges in Infusing Peer Assessment

One of the few studies that draws attention to the 'how students may benefit' perspective of peer assessment was conducted by Davies (2000). He observed that the peer assessment process had a different impact on students of diverse achievement levels. Specifically, comparison of pre and post-test scores suggested that high-achieving students may have benefited least from their peer assessment activities while low-achieving students statistically benefited most. Thus, this indicates that even though students do benefit from these strategies but the extent to which they individually benefit varies. This agrees with Li and Steckelberg (2004) who claimed learning gains from peer assessment may vary for students at different learning levels.

Li (2012) took the argument a step further and examined how students of different achievement levels may benefit from peer assessment with a mixed methodology approach. Findings shows that low and average students at the early stages in the course benefited more from peer assessment than students at the advanced level in terms of points gained in their revised projects after peer assessment.

Thus, some students would have negative attitudes and hence resistance to peer assessment and this could lead to challenges for teachers to infuse peer assessment in the classroom (Van Zundert, Sluijsmans & Van Merriënboer 2010). It is in particular the issue of fairness– with students not seeing it as fair to assess and give marks to others, or getting low quality feedback from their peers, or feeling the final mark is unfair – which results in resistance to self and peer-assessment by students (Kaufman and Schunn 2011). This may be a key aspect of peer assessment given Taras' assertion that proper formulation of formative assessment requires a summative judgement (Taras 2008). Some ways to overcome such challenges are to provide information about the peer assessment process early on, conduct the peer-assessment anonymously and provide students with many practice sessions.

Preparation of students required in how to assess including how to interpret criteria, to judge peers, and to give feedback sensitively in relation to those criteria. The challenge for students and teachers within present-day classrooms is understanding and learning how these communities are created. Formative assessment has been suggested to support student learning in inquiry-based science education. However, teachers need support in implementing formative assessment practices, such as peer-assessment, in their daily teaching. In a study, formative and summative assessment data were obtained from 98 participants in anonymous self and peer assessment of team members' contributions to a group assessment in business courses. The findings indicate that students are capable of accurately and consistently judging their peers' performance to a large extent, especially in the formative evaluation of the process component of group work. However, the findings suggest significant peer grading bias when peer marks contribute to final grades. Overall, findings suggest that

students are reluctant to honestly assess their peers when they realise that their actions can penalise non-contributing students.

The implementation of peer assessment (PA) in the classroom faces considerable interpersonal challenges. In a quantitative survey study (N = 225) focused on the current use and format of PA among secondary education teachers in Flanders and explore teachers' awareness of these interpersonal challenges. They validated an instrument for measuring teachers' awareness which was then used to investigate how this awareness level relates to their conceptions of the educational value of PA. SEM results show that teachers are slightly to moderately aware with regard to their students' concerns about the impact of interpersonal processes in PA as well as the importance students attribute to anonymity within PA. This study illustrates that teachers' perceived accuracy of PA is a major predictor of their belief in its educational value and opens up a new avenue for research on teachers' awareness of interpersonal processes in PA (Rotsaert, 2018).

In another study, the goal was to improve alignment of assessment practice and theory of practice, by introducing PA to empower students and draw on their funds of knowledge. The PA design is described, and student perception data are analysed alongside lecturer reflections. The focus is on elaboration of personal learning points for the author. Findings suggest the success of PA related to students' ideas about its value, highlighting the importance of motivation to engage as peer assessors. Other findings revealed the author's blindspots, because there were ways that her values and beliefs constrained goal attainment and illuminated next steps.

While it is generally acknowledged that increased use of formative assessment (or assessment for learning) leads to higher quality learning, it is often claimed that the pressure in schools to improve the results achieved by students in externally-set tests

and examinations precludes its use. A study reports on the achievement of secondary school students who worked in classrooms where teachers made time to develop formative assessment strategies. A total of 24 teachers (2 science and 2 mathematics teachers, in each of six schools in two LEAs) were supported over a six-month period in exploring and planning their approach to formative assessment, and then, beginning in September 1999, the teachers put these plans into action with selected classes. In order to compute effect sizes, a measure of prior attainment and at least one comparison group was established for each class (typically either an equivalent class taught in the previous year by the same teacher, or a parallel class taught by another teacher). The mean effect size in favour of the intervention was 0.32 (William, 2010).

However, several studies have further indicated that teachers find students are likely to feel frustrated and lose interest during the learning process if their learning difficulties cannot be resolved immediately (Chen & Huang, 2010; Hwang, Wu, & Ke, 2011). Development of peer assessment skills is challenging. The process requires ongoing and repeated practice for students to become competent assessors. Engagement in peer assessment over the long term requires sustaining both students' involvement in high quality tasks as well as their "passionate positive feelings about these tasks"(Munns &Woodward, 2006, p, 197).

Besides that, research has also indicated that language proficiency among students becomes a barrier for teachers to make students to provide a good feedback or comments. High proficiency students found that their less proficient peers could not implement the feedback they offered and could not provide useful reciprocal comments. Language proficiency significantly affected students' ability to give and receive quality feedback. While some students saw value in looking at peers' work,

perceptions of the quality of feedback determined their overall response to peer assessment (Bryant, 2010).

Peer assessment is a skill that needs repetition and practice, after the students had carried out multiple iterations, they developed a sense of over-familiarity. This resulted in boredom, a barrier also noted in Carless (2005), and confounded teachers' attempts to engage students in the manner they thought necessary to promote proficient peer assessment skills. Once it had become a routine, the processes of peer assessment needed some revitalization.

One of the intentions behind peer assessment is that it can lead students to consider more carefully the same elements of their own work (Black. 2003). As students learn more comfortable when comparing their work and discussing it with peers than with teachers, the likehood of expressing opinions, asking questions and debating options increases (Deakin-Crick, Sebba, Harlen, Yu & Lawson, 2005). On the other hand, a small-scale qualitative study with New Zealand school students found that students believe feedback from peers to be unhelpful because students are perceived as lacking expertise, friends would comment too positively and it is what the teacher says that counts (Peterrson & Irving, 2008).

Many Asian countries are reforming their educational assessment system to incorporate the principles of Assessment for Learning (AfL), and the heart of AfL is learner autonomy (Klenowski, 2009; Sathasivam, Samuel, Norjarudden, Tee & Leong, 2019; Swaffield, 2011). Having teachers to implement AfL and to promote learner autonomy is found to be difficult (Marshall & Drummond, 2006). Reeves (2009) had conceived a framework that contains three levels of pressure that may prevent teachers from the implementation of learner autonomy. The three levels are 'pressure from above' (e.g. policies, school administrators, parents); 'pressure from below' (e.g.

students' listless reaction to activities) and 'pressure from within' (e.g. teacher's beliefs or personal dispositions).

Policies are conceived and delivered as top-bottom models, but the responsibility to translate these policies into practices lie solely on teachers. Moreover, teachers are still required to adhere to fix curricula and prescribed texts. Additionally, external agents like school principals or parents often burden teachers with the responsibility and accountability for students' behaviour and outcomes; thus preventing teachers from implementing learner autonomy. Autonomy supportive strategies such as providing students with choices and taking in their ideas when making decisions may look simple, but it is too time-consuming, and thus the concept of learner autonomy is not valued (Deci & Ryan, 1985).

Teachers also face pressure from below as their students expect them to initiate the learning agenda (Taylor & Parsons, 2011). Asian students reacting passively to their teachers' invitation to participate in activities such as presentations or providing feedback to their peers as they perceive that voicing their views especially those that are contradictory to teacher's view as an impolite behaviour and is unacceptable (Sierens, Vansteenkiste, Goossens, Soenens & Dochy, 2009). Thus, students' disengagement from these activities demotivates teachers and many may revert to traditional practices. Teachers' personality disposition may also prevent teachers from implementing learner autonomy. Teachers feel that students are not capable of taking responsibility for their learning (Tran, 2013). This belief could have stemmed from their experiences as students where their teachers had constantly exposed them to control-orientated activities. As such, teachers do not feel confident to try these autonomy-supportive strategies in their classroom. Many teachers were operating in high-stake examination context, belief that they should be the expert that transmit

accurate and relevant knowledge for their students' academic success (Klenowski, 2009).

Therefore, for teachers to implement learner autonomy, they must be allowed to participate in professional development programmes. However, professional development programmes tend to follow the cascading model (Hayes, 2000). The cascading model is where a few teachers are selected and trained at off-site venues, and these teachers would return to their workplace and teach their colleagues. It was found that these professional development models were not able to sustain desirable practices for several reasons. For example, the cascading approach often diluted information (Norzila, 2013). This is due to only selective teachers receiving first-hand exposure; hence, the other teachers would only have limited knowledge of how to implement the desired practices (Nor Hasnida, 2016).

2.6 Reformation of assessment policies and Teacher Change

The purpose of educational reforms is to transform school structures with the aim of raising the quality of education in a country. he vitality of curriculum reforms depends on the teacher's acceptance of the reforms and their principles, because the teachers are expected to put reform ideas into practice (Park & Sung, 2013). Various forms of teacher resistance may block the implementation of new reforms, since responding to reforms is an interpretive act that is personal, interactive, and continuous (cf. Bantwini, 2010). Teachers' resistance is a natural reaction to the changes manifested in their effort to resist reform practices assertively (Berkovich, 2011; Noyes, Wake, & Drake, 2013).

Educational reforms deserve a holistic examination of their reasons, objectives, application and results generated, by those within the school systems where they are implemented. Background: In School-Based Assessment (SBA), teachers have the

autonomy to carry out formative and summative assessment. In a sense, teachers' integrity and credibility is recognized and enhanced. Teachers are indeed suitable to continuously monitor their students' performance in schools. SBA was officially introduced by the Ministry of Education Malaysia, and implemented in stages, in-line with the Standards based Primary School Curriculum, starting in the year 2011 as part of Malaysia's educational reform. Literature has shown that teachers still have difficulty in accepting the changes made in the school assessment policy, they do not get sufficient information on SBA and as well as relevant trainings. Although peer assessment has several benefits, however involving students successfully in peer assessment is not an easy task and there are several factors which may decrease the efficiency of peer assessment. To facilitate good quality of peer assessment, teachers must take time for "organisation, training and monitoring" (Topping 2003). To help teachers with planning and organising peer assessment, several authors (Topping 2009, Falchikov and Goldfinch 2000) have outlined the guidelines and the most important issues to be considered.

In a study at Malaysian primary classroom (Sidhu, 2018) the findings revealed that the implementation of SBA left much to be desired and was far from formative assessment. Though teachers expressed rather positive opinions on SBA, they lacked a full understanding of the method and admitted possessing a limited knowledge of the revised curriculum altogether. Teachers provided little or no constructive feedback on assignments, and learners were not encouraged to reflect on assignments. There was little evidence of peer and self-assessment required for developing autonomous learners. Teachers cited time constraints, classroom enrolment, heavy workload, and lack of training as their main challenges against the effective implementation of the Common European Framework of References (CEFR)-aligned SBA.

Another study in higher Malaysian Learning Institution (Singh, 2017) the findings revealed that the current assessment practices of the lecturers included several modes of assessment, with oral questioning and peer assessment modes being used more frequently than others. The feedback modes employed were also varied with giving comments and correcting student answers or errors as the most common modes. The results provided evidence that besides teacher assessment, peer assessment was found to be another form of assessment favoured by the lecturers during the teaching and learning process. It was used to assess student presentations, to correct peer errors, and to give feedback. The findings were used to guide decisions on the need for assessment training for lecturers, educators and curriculum developers regarding the types of assessment modes for incorporation in teaching and learning, and also the need for assessment training that would provide lecturers with the knowledge and confidence to use a variety of assessment modes. Thus to prepare students at the higher institutions for the change, infusing peer assessment at the primary school is very much beneficial and supports this study. Being driven by both industry needs and human development needs, there is a clear recognition that in the 21st Century, at the centre of all the educational resources and programmes, quality teachers and their education are a primary factor in improved student outcomes and achievement. The government has put in efforts to change the assessment culture in the form of school-based assessment to avoid viewing students' scoring A's as a way to measure success.

For a better classroom assessment implementation, teachers' competencies should be elevated through continuous professional development in the three main components of the teaching and learning process; content, pedagogy and assessment (Rohaya et al., 2014). A study conducted by Rohaya (2014) on assessment for learning in Malaysia revealed that teachers were unprepared for the change and found the new

system challenging. They were required to learn new skills. Most of the time, they had to learn through experience and more of "on-the-job" training. Teachers need to view assessment as a vehicle for classroom practices and crucial for helping students learn. Teachers should also regard AfL as a key to professional skills (Rohaya et al., 2014). AfL should be embedded in the planning of everyday classroom activities. Learning outcomes, teaching strategies and assessment criteria should be carefully designed. Students should be informed in advance what they will learn, as well as how and why they are to be assessed (Rohaya, 2014). Teachers' daily and weekly planning should be flexible so that they can adapt in response to new information, opportunities or insights. Their planning needs to include strategies to check if students understand the goals being pursued and the criteria to be applied in assessing their work.

Falchikov (2005) has suggested a generic pattern of how to carry out peer assessment. Some of those patterns are dissemination (staff development conferences, workshops etc.), preparation and training of students (benefits, mechanisms, pre-measures e. g attitudes), decisions about criteria (teacher-student negotiation/ discussion), methods of measurement (checklists, rating scales, model answers etc.), implementation (feedback, formative/ summative assessment), evaluation (by students as well as teachers), outcomes (the correspondence of teacher and student marks, effects on learning, effects of practice, benefits to teachers/ students, problems, post-measures e.g. attitudes), improvements and modifications to schemes (learning from experience, application of theory/ psychological principles etc.). (Falchikov 2005). In 2009, Peng modified Falchickv´s pattern scheme for his study and divided it into pre-implementation, implementation and post-implementation phase. Pre-implementation phase (preparation, training and technology), Implementation phase (demonstrating how to carry out peer assessment, monitoring the peer assessment process and making

adjustments when necessary, discussing concerns that emerge from the peer assessment process and providing solutions, monitoring the quality of peer feedback, evaluation students´ work is assessed by students and/or teachers, enabling peer discussion before evaluating the work of peers, emphasising the importance of giving constructive feedback), Post-implementation phase (outcomes and investigations, identifying problems and making improvements and modifications for better implementation in the future.

To begin with, teachers should first of all identify their purpose for using peer assessment, (Greenstein 2010). Secondly, Maiz Arevalo (2008) emphasizes the importance of secure classroom atmosphere. It is not advised to carry out peer assessment before the students are familiar and comfortable with their classmates as well as the teacher. As for the phase of making decisions about criteria, it is very important to involve the students into the process of developing the criteria for assessment (Topping 2009). In the training phase, it is the teacher´s task to show the students how to do peer assessment. Greenstein (2010) emphasises the importance of teaching students that the feedback they give must be constructive, i.e. all their evaluative comments must be supported by evidence. During the next phase, the implementation phase, teachers are advised to monitor the process but keep a low profile and give further instructions and feedback when necessary (Topping 2009). Next will be the outcome of peer assessment, as Greenstein (2010) has put it: "feedback from peers should show students their weak areas and the steps they can take to progress towards goals." Both Falchikov (2005) and Topping (2009) suggest teachers to compare a portion of peer assessment against their own assessment of the product or task. It is important that teachers not assume that their assessments are more reliable than the peers´ (Topping 2009).

2.7 Conceptual Framework

The infusion of peer assessment draws a comprehensive picture of a teacher role in fostering student interaction because it describes teacher competencies that span across all infusion phases of collaborative with students. This framework (Figure 2.2) includes how are the current teaching practise in science classrooms, challenges in achieving learners' autonomy, the gap of this study and effects of this study on science teachers. Various strategies on the infusion of peer assessment and how this research will be conducted in general will be discussed.

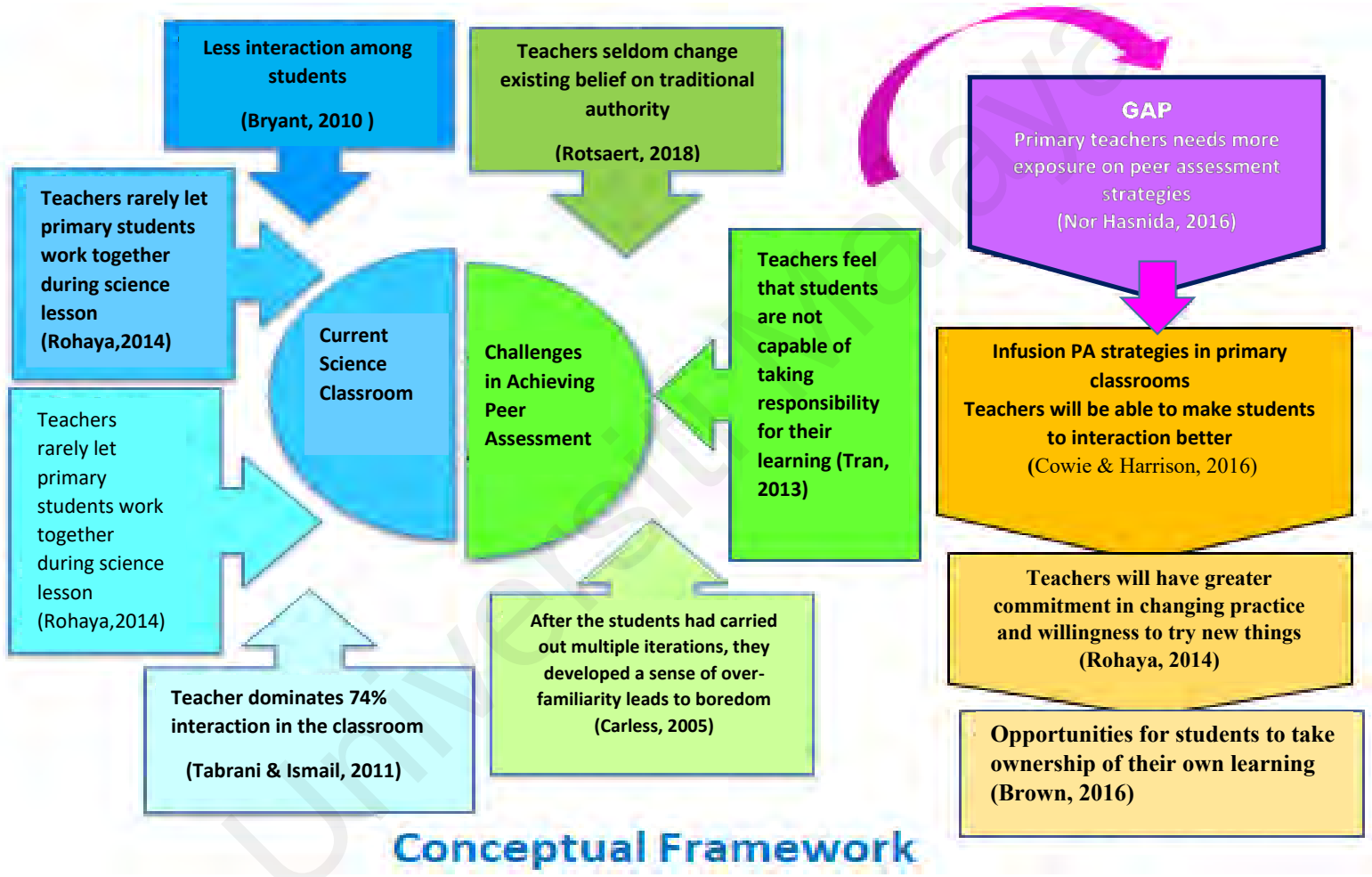

Figure 2.1 Conceptual Framework for Science Teachers' Infusion of Peer Assessment in Primary School

Usually in science classroom, teachers rarely let primary students work together either in group or peer during science lesson (Gillies & Boyle, 2010). This practise of teachers leads to less interaction among students (Johnson & Johnson, 2008). As teachers always feel they are the traditional authority in classroom, they rarely take students opinion ((Hampden Thompson & Bennet, 2013). Overall literature shows teacher dominates 74% interaction in the classroom (Tabrani & Ismail, 2011).

These teaching practises of teachers need to be changed but several challenges are there making teachers refuse to change. The most major one is teachers' beliefs itself, they always feel they are the authority in classroom (Ku & Lohr, 2003; Roskams, 1999). Asian culture of teachers' belief that their say is always right instead of students and their peers (Hedgcock & Lefkowitz, 1994). This eventually makes teachers difficult to develop learners' autonomy (Thompson, 2009). Teachers also feel peer assessment strategies burdens teachers besides their daily chores (Blatchford, Kutnick, Baines, and Galtin, 2003).Teachers finds it very difficult to infuse peer assessment activities as they are lacking continues support and training in strategies to infuse it in an effective way (Rozi, 2013).

From the literature, to fill the gap, a view that helps teachers utilize peer assessment strategies in teaching practice and promotes peer interaction among students in primary classroom is needed. To support this need, this study focused on selected science teachers' infusion of peer assessment strategies in classrooms. As this study is carried out, teachers abled to construct new knowledge about teaching and made changes to their existing teaching practice (Butler, 2004). During the infusion process, teachers was able to shift students' role from passive recipients to more self-directed learners (Knowles, 1990). As teachers practice this peer assessment strategies

in their classroom, in long run they be able to view how effective own teaching is (Black & William, 1998).

2.8 Theoretical Framework

Self-regulated learning (SRL) is central to the development of theoretical framework for learning motivation of peer assessment which has three aspects, competency, autonomy and relatedness. SRL is goal oriented, conscious, and not under a tutor's immediate control (Rheinberg et al., 2000). The theory of SRL is used in this study as it highlights the educational task of improving the learners as the essential element in achieving good quality of peer assessment strategies. According to previous studies, SRL offers a framework to understand why students engage in activities and how teachers can manage contextual variables and regulatory process that may interfere with interactions or task features (Bioche et al, 2008).

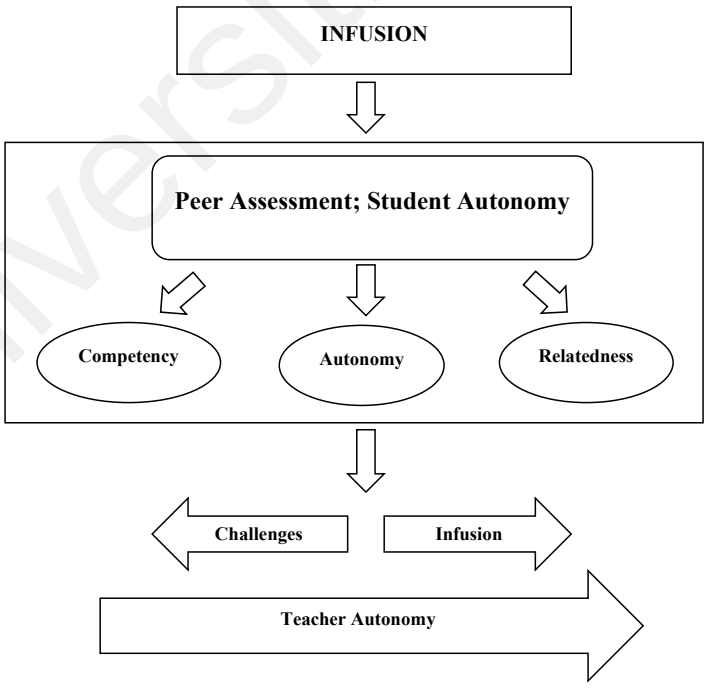

Figure 2.2 Theoretical Framework

2.7.1 Competency

The focus of the peer assessment approach is to create learning environments that support students' centered learning activities. For example teachers give students the chance to build knowledge in the term of language and scientific understanding by involving actively during peer assessment activities. Teachers feel students are more competent when they are given the chance to engaged in activities that makes them to think out of the box and share information compared to teacher being the knowledge provider (Brown, 2016). In peer assessment classroom, teachers can encourage students to interact with peers and give/receive instant feedback. This can provide constructive feedback to students on the progress of their learning and this benefits their competence level (Rohaya, 2014). Besides that, in class learning activities such as differentiated tasks is needed to ensure the assigned tasks are in line with the learners' level of understanding and skill. All the peer assessment activities could be used to make the students feel competent in their learning tasks when they can meet challenges during the activities (Bryant, 2010). In fact peer assessment strategies should not be too difficult and the same, yet not too simple to evaluate and develop students' skills.

2.7.2 Autonomy

Studies found that when teacher offer student's choices, the choices will increase self confident and motivation (Bryant, 2010). For example, in this study when learners voluntarily choose to spend time and energy to learn the basic science content knowledge, they are considered autonomous via peer assessment strategies (Brown, 2016). Being an active learner requires time and space to take ownership of the learning process. As a result, when learners are in control of their conduct, they feel relaxed and comfortable. Autonomy can be also be referred to independent learning

(Zainuddin & Pererra, 2017). In peer assessment strategies, teachers can improve this by providing alternatives of learning methods during presentations and experiments. By treating students as active participants, the peer assessment approach is to fullfill the need for autonomy of learners and thus affect their learning attitude through integrated regulation, which will lead to increased motivation. (Bryant, 2010).

2.7.3 Relatedness

An individual with a sense of community, belonging and shared purpose defined as relatedness (Trenshaw et al., 2016). According to SRL, there are two aspects to support learners' emotional requirements for this component, which consists of interaction between teachers-students and also interaction between peers. Therefore the level to which the learning environment used in peer assessment classroom fulfils students' need for relatedness is essential to determine the level of motivation (Brown, 2016). Through peer assessment strategy, it is likely to have a learning environment that supports small learning groups to increase their level of interaction among peers. Also moving direct instruction outside of class time enables more time for teachers to interact with students individually or in a small group of students. Thus it can be used to enhance the student experience of relatedness to teacher. Overall it can be said as learning environment created by peer assessment strategies are expected to meet the students' needs for competence, autonomy and relatedness and therefore, contribute to a greater level of motivation based on SRL (Hadwin, 2010).

2.8 Summary

The SRL theory that connects the peer assessment motivation and achievement in the theoretical framework is shown in Figure 2.3. The new reformation requires teachers to conduct formative assessment strategies therefore teachers needs to be competent enough to infuse and overcome any challenges that may arise throughout teaching and

learning. There are other studies related to peer assessment in primary school and tertiary education in Malaysia but more focused on other subjects. As a results, the current study explores peer assessment strategies among science teachers in primary school using qualitative methodology, whether teachers may lead students to become more autonomy.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter will discuss the research design, the sample, data collection procedure and the data analysis of this study. The objectives of this study were to investigate how primary science teachers infuse peer assessment practices in their daily lessons and what challenges do they face with doing so. This chapter has been organized to reflect the series of chronological events that took place during the course of data collection.

3.2 Research Design

In this study the researcher adopted a descriptive research design (a qualitative research) as qualitative research reports are rich in details and insights and help better understand 'social sciences' findings. Descriptive research was selected as the school with socioeconomic background was situated in an urban area and researcher was interested to find out how the teachers infuse peer assessment strategies in their daily science classrooms.

As Merriam (2009) noted, in qualitative research the researcher tries to capture people's experiences and understanding of the world in terms of the meaning they bring to the world. In other words, the qualitative method is used in the natural context without manipulation of the context. As the researcher needed to engage with selected science teachers who participated in this study and observed how they infused the peer assessment strategies in their classrooms, the researcher felt that qualitative methodology was an appropriate way to achieve the research objectives. Table 3.1 shows the research objective, research question, and what data was collected and how it is analysed.

Table 3.1

Research objectives, research questions, data collected and data analysis for this study

Research Objectives	Research Questions	Data Collection	Data Analysis
To investigate the selected primary science teachers' infusion of peer assessment strategies in the classroom.	How are the selected primary science teachers' infusion of peer assessment in classrooms?	Classroom observations, Interview	Identifying 'episodes' based on teachers' infusion of peer assessment strategies.
To identify the challenges faced by the selected primary science teachers when infusing peer assessment strategies in the classroom.	What are the challenges faced by the selected primary science teachers when infusing peer assessment strategies in the classroom?	Interview	Thematic analysis

3.3 Selection of Sample

There were difficulties in obtaining permission from school principals as they were worried that their teachers' involvement in the study would disrupt the lessons or that their teachers might be uncomfortable with the researcher's presence. Even after explaining the aim of the study was to collect data about teachers' current practices and not to evaluate them, many of the principals were still reluctant to allow the research in their schools. After many attempts, finally one school seemed interested to participate. Thus, this study was conducted in only one school.

The school was in a semi-urban area. Even though, the school was in rather upcoming area in terms of development, however many of the students in this school were from low socio-economic background. They primarily came from low cost flats situated near this school and most of their parents were blue collar workers. As such, the school was listed as a low performing school. However, the principal of the school was very forward minded-thinking woman who was very pleased to welcome research in her school

as along as all the relevant permission from the Ministry of Education was obtained. Once all the permission papers were produced, the principal instructed her science teachers to attend a meeting with the researcher. A briefing regarding the scope of the research was presented to eight teachers. They were told that their participation was voluntary. However, only three teachers were interested to participate in the study.

The three teachers were Ali, Kala and Zeti. There were given pseudonyms names for ethical reasons. Kala is 39 years old and has a Degree in Science (Biotechnology) from the University of Malaya. She enrolled in Postgraduate Diploma in Education (*Diploma Pendidikan Lepasan Ijazah,* DPLI*)* that gave her the opportunity to teach in public primary schools. She has taught science for 13 years. Kala held positions such as Head of Science and Head of Art. At the time of the research she was teaching Science for Year 4 and Year 6. She has attended several courses such as school-based assessment *(Pentaksiran Berasaskan Sekolah),* Dokument Standard Kurikulum dan Pentaksiran for Science Year 1 to 6, courses on team teaching and many more.

Zeti is 29 years old and has a degree in Teaching English as Second Language. She has six years of teaching experience and all those years were in the present school. Even though science is not her specialization, Zeti has taught all levels of science from Year 1 to Year 6 as well as English. She has attended training in DSKP for Year 1 science subject and an English training course for teachers in Year 1 to Year 6. Zeti has several responsibilities in school such as *Guru kebajikan, Guru Pusat Sumber and Media* and had in fact been the Head of Science in the past.

Ali is 25 years old only and he also held a bachelor's degree in Teaching English as a Second Language (TESL). He has just graduated, thus having only six months of teaching experience. He taught English Year 4, History Year 5 and Science Year 4. Ali has attended courses such as school-based assessment, Team teaching and

Common European Framework of Reference for Languages. He is currently the Academic Coordinator (Year 1-Year 5) in his school.

3.4 Data Collection Techniques

The qualitative data collection techniques that were used in this study were classroom observations and interview sessions. Different techniques were used in this study to obtain the necessary data to address the two research questions. Kagan (1990) has pointed out that "the use of multimethod approaches appears to be superior, not simply because they allow triangulation of data but because they are more likely to capture the complex, multifaceted aspects of teaching and learning" (p.459). The multiple data sources allow for triangulation of data to reduce biasness and at the same time develop a deeper understanding of the issues under study.

The data collection techniques in this study used to obtained data about teachers' infusion of peer assessment strategies and challenges in infusing these strategies were classroom observations and interviews.

i) Classroom Observations

The usefulness of observation is that "it involves the direct study of behaviour by simply watching the subjects of the study without intruding upon them and recording certain natural responses to their environment" (Rea & Parker, 1997; p.3). The classroom observations were done to see how the participating teachers infused peer assessment strategies in their daily science lessons.

For the present study, classroom observations consisted of the researcher's field notes as well as audiotaping of the general classroom discourses. During the classroom observations, the researcher placed the tape-recorder near her, and it was left on throughout the lesson. An example of the verbatim transcript of the classroom discourse is shown in Appendix D. The field notes describe interesting actions such

as drawing used as artefacts to teach that was observed by the researcher that were relevant to the objective of the study. An examples of the researcher's field notes is shown in Appendix B.

The researcher was a non-participant observer. Malaysian teachers generally do not feel comfortable with the idea of an adult sitting in their classrooms. To be sensitive to these teachers' feelings, the researcher remained as unobtrusive as possible so as not to make the teachers feel they were being intruded upon. Each teacher was observed four times. Since all teachers were teaching different levels, the teachers chose which lessons they want the researcher to observe them. Table 3.2 shows the classroom observations details such as the topics that was being taught for that lesson.

Table 3.2

Classroom Observation schedules and topics for three teachers

Teacher	**Classroom Observation**	**Lesson**
Zeti	First	Magnet
	Second	Absorbance
	Third	Earth Profile
	Fourth	Soil
Kala	First	Rusting
	Second	Solar System
	Third	Solar System
	Fourth	Technology
Ali	First	Rusting
	Second	Solar System
	Third	Solar System
	Fourth	Technology

ii) Interview sessions

Interviews are used to collect information that cannot be observed directly; they are necessary especially when the required information cannot be observed, such as feelings, beliefs and perceptions (Merriam, 2002). Good quality questions in the interview sessions should invite a process of exploration and discovery (Creswell, 2007). If the initial questions are too focused, it would lead to 'tunnel vision' data that inhibits the researcher's understanding and the analysis process of the subject under study (Agee, 2009).

The interview sessions were held with the teachers in this study to elicit a deeper understanding of the teachers' infusion of the peer assessment strategies that had been observed in the classroom and probe for challenges that these teachers faced when conducting these strategies. Thus, there were two different set of questions asked: (i) to gain a deeper understanding of teachers' practices and (ii) to gain information about the challenges that teachers faced as their infused the peer assessment strategies in their daily lessons.

The interview sessions to gain a deep understanding of teachers' practices were usually done immediately after the lesson. However, if teachers were not free immediately after the lesson, interview was done within the same day after school hours. The interviews with the science teachers was conducted in English. However, considering that some teachers are not proficient in English and to gain accurate information, the interviews with teachers was also conducted in Bahasa Melayu their native language or according to their preference. The questions for this interview sessions were open-ended and focused on that day's lesson. Some of the questions asked were …*How did you provide the answer when Jalil said he did not understand? Do you think the time you provided for the activity was adequate and why?* The

interview sessions usually lasted about 15-20 minutes as many of the teachers did not have the luxury to spend more time with the researcher.

The interview sessions to gain information about the challenges that teachers faced infusing peer assessment strategies were done at the end of the study. The researcher asked questions like *Are the resources adequate for you to implement the peer assessment strategy? Why do you say so?* The teachers were asked to choose a place and time that was convenient for them to have this interview. However, only one interview with each teacher was held. This was because the school was preparing for some events and the teachers were busy and was not keen to have more than one session. These interview sessions lasted longer from 30-45 minutes. An example of an interview session with a teacher in the actual study transcribed verbatim is shown in Appendix C.

3.5 Procedure of the Study

Firstly, the researcher visited Educational Planning and Research Division (PPRD) to obtain permission for this research. Using the letter from PPRD, researcher obtained permission at Jabatan Pendidikan Selangor. A copy of the permission letter is shown in Appendix E. A primary school was selected based on support and willingness of the principal. At the selected school, researcher meet with the school principal to showed her all the official letters. When the principal was satisfied with all the documents, she held a meeting with her science teachers in the school. She allowed the researcher to give a short briefing about the research and what was required by the teachers. The researcher reminder the teachers that their participation was voluntary, and they were always free to leave the research if they found it to be too demanding. It was also important to meet the potential teachers who would be participating in the study to build the trust and rapport between the participants and the researcher. This

was to ensure that respondents answered truthfully, so that accurate and trustworthy data would be obtained.

Three primary science teachers had participated based on willingness. Participant Information Sheets and Consent Form were given to teachers to collect some demographic information and to get their permission and approval to join the research (see Appendix F).

The teachers were told that they are given freedom to select with their lessons they would prefer the researcher to observe. Once the teachers gave their preferred schedule, the researcher made sure that there were no clashes and that she had enough time to conduct the interview after each lesson. The researcher was a non-participant observer who sat at the back of the class with the tape recorder placed close by. As she observed the lesson, the researcher jotted down interesting events that could not be captured by the audio recorder. This included diagrams drawn by the teacher or information on power-point presentation done by the students. The researcher also jotted questions that she would want to ask the teacher regarding her practices. The interview was done immediately after the lesson. If for some reason the interview could not be conducted, the researcher would hand the teacher the questions that she had planned to ask. These questions would be asked orally when they meet. The interview sessions were done in the science laboratory but if the laboratory was used, then the interview was held at quiet corner in the staff room.

After the completion of all the four classroom observations which took about two months to complete, the researcher conducted the final interview to gain information about the challenge's teachers faced when infusing peer assessment strategies. However, all the teachers felt that they had provided enough information after that one interview and that due to schoolwork commitment, were not willing to

have more interviews. The researcher found that she did have enough information because of the post-lesson interviews did elicit some of the challenges there. During the data collection period, the researcher had data from the classroom observations and interview sessions with the teacher. She then proceeded to analyse the data.

3.6 Data Analysis

The researcher personally transcribed verbatim all the audio-taped classroom observations/discourses and interview sessions with the teachers. These were then presented to the respective teachers for 'member-checking', another method of validating the data. Member-checking can be "the most crucial technique for establishing credibility" in a study (Lincoln & Guba, 1985; p.314). It means taking the raw data and interpretation back to the participants of the study so that they can confirm the accuracy of the information. All the teachers when through the transcripts and did not have any comments and were satisfied with the document.

There were two sets of data for analysis: one, the teachers' infusion of peer assessment strategies in the classroom where the data primarily emerged from classroom observations and the other were their utterances of the challenges they faced when infusing these strategies where obtained from the interview sessions. Similar ideas and further illustrations or explanations which teachers had mentioned during interview sessions were added on as triangulation to what was observed in the classroom observations.

3.6.1 Procedure for Data Analysis

In analysis the data for the first research question, the researcher looked through the transcripts of the classroom observations for 12 lessons observed. The researcher read through the transcripts and highlighted examples at the verbatim where there was evidence of peer assessment. Looking through the transcripts, the researcher

discovered that the teachers did not conduct the ideal peer assessment strategies as recommended by the literature. The researcher proceeded to identify sections where the teachers showed indication of allowing students to assess or take ownership of their learning. For example,

Kala: Finish ready? Eh come see your question…. hmmmm ok class remember when you make question you must know the answer ya!

Kala: Ok this group ask which group you want to ask….

(OBS1, Kala)

This section clearly indicates that Kala was inviting her students to ask another group question. These kinds of interaction where teachers were not providing answers or taking control of the lesson are marked and indicated in the transcripts by the researcher. The discourse analysis was named as episodes. Each episode would begin when teachers ask students for their ideas or invite them to give input. As the classroom discourse continues it would remain in that episode until the teacher either steps in and takes control of the lesson, or the discourse comes to an end and the teacher moves on to another activity.

The researcher identified these episodes. There were 23 different episodes identified. Looking through the episodes, the researcher categorized the episodes was "impressive", "intermediate" and "inferior".

Under the category of Impressive, teachers gave autonomy to students to take ownership of their learning. They asked their students questions but allowed their peers to answer. The teachers also do not rush to provide the correct answers and are more constructive in their feedback. For the "intermediate" category, execution of the strategies was not done effectively to categorize them as successful. Examples were

where teachers gave unclear instructions regarding peer assessment strategies that did confuse students at the beginning. However, the teachers quickly realize their shortcomings and immediately provided more constructive pedagogy to support students' peer assessment activities. Also, there were attempts by teachers to carry out strategies that could help promote empowerment.

For the "inferior" category, the strategies were deployed ineffectively, that it resulted in detrimental consequences for their students' learning. For example, even when teachers did get feedback about their strategies that confused students, the teachers did not heed to students' comments about their lack knowledge on how to procedure. The strategies were conducted haphazardly, and student learning was not enhanced as many of the students were confused. Based on this categorization, the researcher chose two episodes for each category to explain in the findings section.

To answer the second research question, the researcher used thematic analysis to come up with relevant themes with regards to teachers' challenges when infusing peer assessment strategies. The researcher read and reread the transcripts and identified codes that had similar ideas and meaning. From these codes, themes were identified. Example of the codes and themes are shown in Table 3.3.

Table 3.3

Examples of the Codes and Themes on the Teachers Interview

Themes	Excerpts
Perceived pressure of time and work	*I want to search for more materials, initially I feel pressured in preparing materials for all students (Ali)* *I may want to do more peer assessment in the classroom, but I have a textbook to finish and a curriculum to follow (Zeti)*
Reluctance to change	*I think is we stick to our old fashion teaching for* *example like myself sometimes I don't really try to a new one (Kala)* *I teach as what I was taught during my training as teacher being the knowledge provider. So, when suddenly I was told that I can give autonomy to students, hesitated at first (Ali)*
Language proficiency	*Most students cannot give correct grades or feedback to their friends because they do not have enough proficiency themselves or their language level is not enough to express themselves correctly (Zeti)* *My students who assessed work completed by peer of higher language proficiency expressed discomfort with the task because they could not identify errors (Kala)*
Routine and boredom	*The first time they feel, 'Wow' The second time, Hmm, I can do this.' The third time, 'I can do it with confident' The fourth time, 'It's boring' The fifth time, 'I want to sleep (Zeti)*

3.7 Summary

The methodology of this study utilized two different data collection techniques to obtain data to answer the two research questions that were put forward in this study. The selection of the sample and the analysis of the data have also been discussed in this chapter. The next chapter presents the findings and discussion of the data collected.

CHAPTER 4

FINDINGS

4.1 Introduction

This chapter would cover the findings of the study. There are two main sections of this chapter corresponding with the two research questions. The research questions are as follow:

1. How are the selected primary science teachers' infusion of peer assessment strategies in the classroom?
2. What are the challenges faced by the selected primary science teachers when infusing peer assessment strategies in the classroom?

4.2 Teachers' infusion of peer assessment strategies

During the infusion of peer assessment, various strategies were employed by these teachers. However, these teachers' capabilities to infuse these strategies varied. Some of the strategies were infused more effectively leading to various venues where students are empowered to take ownership of their learning and these practices showed some potential of effective peer assessment strategies. However, the way some of these strategies were infused did not lead to empowering students. The teachers seem to practice traditional classroom discourse.

In this study, there were three ways that teachers infused peer assessment strategies in the science lessons. Based on the activities presented, the classroom discourse and the students' involvement, the selected teachers' infusion of the peer assessment strategy could be described as 'Impressive', 'Intermediate' and 'Inferior'

4.2.1 Peer Assessment Infusion: Impressive

Under the category of Impressive, teachers gave autonomy to students to take ownership of their learning. They asked their students questions but allowed their peers to answer. The teachers also do not rush to provide the correct answers and are more constructive in their feedback.

In one episode, Kala was going to introduce the topic on Rusting. She began her lesson by eliciting students' prior knowledge.

Kala:	*Where have you seen objects that is rust? What colour is rust?*
Din:	*Brown…. toolbox…*
Kala:	*Ah toolbox, your parents….is there any other colour than brown?*
Din:	*brown black*
Kala:	*The brown is how ya? What type of brown?*
Siti:	*Brown Red*

(OBS1, Kala)

Getting information about students' prior knowledge was important, as Kala said it gave her an idea on how to proceed with the lesson. As the excerpt above shows, Kala did not just accept the students' answers, instead she encouraged them to describe to their peers about the experience about rusting.

Then, Kala allowed her students in group to discuss about how they can avoid rusting. Students excitedly got into groups and started the discussion.

Siti:	*Eh how are? Maybe can colour….*
Din:	*Colour? Are you sure?*
Siti:	*Err…..could be….*

(OBS1, Kala)

In one group, a discussion between Siti and Din showed that students do not just agreed with their peers. Where Siti had mentioned colour, Din hesitated to agree with Siti. After giving them time to discuss, Kala had to check for their understanding. She asked the Siti-Din group about their discussion outcome. Siti mentioned colour.

Kala: *Ok this group give one way how to avoid rusting?*
Siti: *Errr….colour?*
Kala: *colour? Correct or not? My question was 'avoid'*

(OBS1, Kala)

Here, Kala understood that the students had misunderstood her questions and explained the meaning of 'avoid' before asking them to proceed with their group discussion. After about 15 minutes, Kala called for a group discussion. She wanted her students to find ways on how to avoid rusting. One of her students had mentioned to put on potato skin on metal to prevent rusting.

Kala: *Ok have not rust, can anyone explain?*
Farid: *Potato skin!*
Kala: *ok I want another student to give feedback, Hana come on….*
Hana: *Farid, why must use potato skin?*
Farid: *(silent)*

(OBS1, Kala)

Instead of giving her feedback, Kala encouraged Hana to give feedback to Farid. Therefore, Kala did not become the sole provider of feedback. Even though, Hana did not know of to give the relevant feedback, but there was an attempt to infuse the peer feedback.

Kala continued to ask students to do discussion on the ways of avoiding rusting example painting, grease and plastic. Finally, Kala asked her students to develop questions about rusting.

Kala: *Finish ready? Eh come see your question…. hmmmm ok class remember when you make question you must know the answer ya!*
Kala: *Ok this group ask which group you want to ask….*
Tina: *What is plating?*
Lina: *Covered with Tin*
Kala: *ok I want to add question, why covered with Tin?*
Whole class: *(silent)*

Kala: *so that to avoid rusting, ok this group correct or not?*

(OBS1, Kala)

Kala gave autonomy to students to develop questions on their own. She also gave the freedom to students to select their peer to answer their questions, which would avoid biasness and encourage students to make a choice. Sometimes Teacher Kala feels questions that students ask is not up to her par, so she interrupts the conversation among students. She only does show her authority when she wants to further enhance the quality of the conversations. However, Kala still encourages students' feedback on any explanation that she gives.

Kala: *Ok another group ask*
Siana: *What is the observation after object is painted?*
Gaya: *Object will be nice, and it will not rust*
Kala: *Correct or not?*
Jana: *Teacher my answer is it will look nice and shinny*
Kala: *ok others agree or not with the answer?*

(OBS1, Kala)

Kala encourages her students to speak out and not to be worried if their answers are correct or not.

Kala: *Who can explain how is the surface of rust?*
Din: *Rough…rough*
Kala: *ok rough*, *correct* ah?
Siti: *Yes teacher*
Kala: *ok who wants to add? Is there any other answer than rough?*
Farid: *Not even!*
Kala: *Correct ah if surface that is not even? Have you touch before surface that is rust?*

(OBS1, Kala)

Kala respects her students' opinions and hardly condemn them, but in fact she motivated them to speak up. When questioned why Kala encourage them to speak up and are comfortable voicing out their feedback although they doubt sometimes, Kala explained that,

> *I always ask a lot of questions and make them to answer although the answer might be incorrect. Usually they are not able to ask their peers.*
>
> *(I1, Kala)*

Peer assessment strategies motivates students to express their opinions in a safe learning environment. Kala had impressively infused the peer assessment strategies in a supportive, non-threatening environment where it is safe to share thoughts without the worry that any demoralising, destructive comments would be uttered. Peer assessment emphasizes important that students feel comfortable; otherwise, teachers would reap maximum benefits.

Kala explained on a rusting experiment from the textbook, using questioning technique. As she explains, she was drawing on the board for students to have a better view and understanding on the experiment.

(FN 1, Kala)

Kala:	*Ok who can do conclusion for this experiment? Come on try wrong never mind!*
Siti:	*The presence of water and air makes rusting*
Kala:	*ah class correct or not?*
Whole class:	*Correct*
Kala:	*Ok so the conclusion is presence of water and air makes rusting*

(OBS 1, Kala)

Kala hardly gave her own opinion first instead always provokes students to speak. Then she requested another opinion from students itself and only after that gives her own feedback. Peer assessment or peer review provides a structured learning process for students to critique and provide feedback to each other on their work. It helps students develop lifelong skills in assessing and providing feedback to others and equips them with skills to improve their own work.

In another episode, where Kala was teaching about the Solar system, she asked her students if they knew what a solar system is. She questions the students till they can give the required information.

Kala:	*Ok what are there is a solar system?*
Whole class:	*got planets*
Kala:	*how many?*
Whole class:	*8*
Kala:	*Haris, correct 8? 8 or 9?*
Haris:	*8 teacher, pluto is not in*
Kala:	*why pluto not in?*

(OBS1. Kala)

Peer assessments empower students to take responsibility for and manage their own learning. Kala brings well the student's knowledge, with questioning technique till they can provide most of the information needed.

In Ali's class, there was an episode where he had managed to ask students questions about rusting.

Ali:	*Ok I have one object here what object is this?*
Whole class:	*Tin*
Ali:	*ok tin, tin is made from?*
Whole class:	*Iron*

Ali: *ok let's say teacher put this tin outside at the parking area for a few weeks, what do you think will happen?*
Saleh : *Rust…rust*
Daris: *Dent…dent*

(OBS1, Ali)

Instead of just telling the class what they are going to learn in the lesson, Ali used questions to give an idea to students on the topic. Ali's strategy motivated students to engage with course material more deeply. Even though, it might not be the peer strategies that are mentioned in the literature, however, it would be better to encourage peer assessment in activities that the students are familiar with. Thus, Ali encourages his students to develop the skills before applying other peer assessment strategies in lessons.

Establishing from the beginning that the purpose of peer assessment will help students to understand assessment and what constitutes progress and success. This will eventually lead them onto planning their own work to meet their own individual targets.

In a smaller group discussion, Teacher Ali requested students to predict which object gets rusty and which object is not,

Ali: *ok class can you predict which object gets rusty and which does not?*
Wani: *Err ….i don't know*
Hani: *ah try to recall back have you seen this object getting rusty?*
Wani: *Ah …nail yes yes outside my house, now I know ready*

(OBS1, Ali)

In this group discussion, Ali motivated students to comment in small group discussions and to help each other learn. Ali gave them a few minutes before the discussion in order to get their thoughts together. If they feel confident enough, they

can discuss their work with the class and check it against the learning objective and success criteria.

Ali:	*Class will scissor rust?*
Zani:	*hmmmm….well I think yesss, what you think Nani?*
Nani:	*I think so too, the surface is rough and blunt*
Ali:	*How do you know it is blunt? Did you touch it?*

(OBS1, Ali)

Teacher Ali ensure students relate their learning back to the learning objective and success criteria in small group discussion. He also listens to group feedback discussions and provide guidance and input when necessary. Ali was also prepared to give feedback on students' feedback to each other. Peer assessment encourages to display some examples of feedback of varying quality and discuss which kind of feedback is useful and why.

Ali:	*Objects that gets rusty made from iron, not rusty made from?*
Gana:	*Plastic, rubber and wood*
Ali:	*has anyone seen this getting rusty?*
Hana:	*errrr……let me think so far my eraser does not gets rusty*
Yaris:	*Yeah I agree with that, eraser is made from rubber so it does not gets rusty!*
Ali:	*Bravo Yaris, I like this part, you are able make connection, good feedback!*

(OBS1, Ali)

Ali let students know the rationale for doing peer review and explain the expectations and benefits of engaging in a peer review process in his lessons. His students were able to review peers' comment and give a reasonable feedback in a small discussion. It is necessary the correct language to use when peer assessing.

(FN 1, Ali)

Ali always encourages his students to be hands on while learning science lessons. Ali beliefs students must feel and touch to learn science and not just from textbook. When questioned him, he explained …

> *Science need to be felt and not memorized, so I always encourage my students to do experiments in group but have not tried pair yet, but I am willing to try it out. During experiment students can state their opinion to their peers.*
>
> *(I1, Ali)*

After the experiment, Ali made a conclusion,

Ali:	*Ok what conclusion can you say from this activity? See what the same about object that is getting rusty is.*
Hana:	*Made from iron teacher! so objects that gets rusty is made from iron.*
Ali:	*Good job Hana! Objects that does not gets rusty is made from?*
Jaris:	*Teacher teacher I know from wood, plastic and rubber.*
Hana:	*So teacher conclusion, objects that gets rusty is made from iron and not rusty made from wood plastic and rubber, correct teacher?*
Ali:	*Super Hana! Yes that's the conclusion! The best part is you were able to relate it.*

(OBS1, Ali)

Ali manage to empower students to take responsibility for and manage their own learning. Ali also gives good feedback to students' opinions. **It is not just what teacher said but the way that teacher used suitable** language encourage peer

assessment. He motivated using phrase like “good job” and “super Hana” to further encourage students to be involved in the process. There encouragement could go a long way in enabling students to be effective assessors.

Ali:	*Ok let’s recall the lesson, surface of rusting objects is smooth, correct?*
Yaris:	*No no teacher it is rough*
Ali:	*ha ha…. well done Yaris, you were able to detect my mistake! Yes, surface of rusting objects is rough.*

(OBS1, Ali)

Ali gave students the opportunity to assess his work or understanding of the concept being taught. He talked his way through his learning as if he were one of the students. He made some instructional decisions to insert some mistakes to see if his students were able to pick up on these and provide him with good feedback. This provides opportunity to students that they can recognise that what teacher is doing or saying is wrong and tell teacher how to improve or put right those mistakes.

4.2.2 Peer Assessment Infusion: Intermediate

Strategies employed in this category were where the execution of the strategies were not done effectively to categorize them as successful. Examples were where teachers gave unclear instructions regarding peer assessment strategies that did confuse students at the beginning. However, the teachers quickly realize their shortcoming and immediately provided more constructive pedagogy to support students’ peer assessment activities. Also, there were attempts by teachers to carry out strategies that could help promote empowerment.

Peer assessment is much more than asking students to make each other’s work. If it is going to be effective it must be done in a way that helps students to engage with and reflect upon each other’s work and consider how the work can be improved. In an

episode, where Zeti wanted to introduce peer marking, she asked her students to get into groups.

Zeti:	*Ok class I want all of you to sit close to each other in pairs. I am going to give you a paper with question to answer. Only one pencil, both share and discuss the answer.*
Siti:	*Eh Farid teacher said one pencil*
Farid:	*ok ok….one pencil lah*
Zeti:	*Come on discuss, try to answer*

(OBS2, Zeti)

Zeti had a hard time making her Year 1 students to get in pairs and to familiar them with the concept of sharing and discussing ideas. Many of her students were looking blur as this was their first time doing a group activity. Thus, at the beginning there were not many discourses, but this eventually picked up.

Din:	*Farid, what are the three types of soils?*
Farid:	*Clay, garden, sand…. maybe?*
Din:	*Hmm…. could be could be…. how you know all these?*
Farid:	*Oh, I always help my mum at the garden…she showed me before.*

(OBS2, Zeti)

Listening at the conversations her students held in the group, she Zeti was amazed that her students were able to give opinion and further enquire and not just accept the answer when she gave them an opportunity to do this discussion. Peer assessment enable her students to give each other valuable feedback so they learn from and support each other. It adds so much more to learning and the opportunity to talk, discuss, explain and challenge their peers. However, not all groups where made up of the same dynamics. For example, one group was not sure what to do until, Zeti approached that group and provided some suggestions. Upon hearing those suggestions, the students were able to answer the questions.

Zeti: *Ok come on, how many types of soil that you know? How many? 1, 2, 3, 4? How many? If 1 write one, if 2 then write two. Discuss with your partner.*
Siti: *three, eh wani what soil you know?*
Wani: *eh I know garden…*
Siti: *ok ok come we write, wait I know sand, clay.*
(OBS2, Zeti)

With Zeti's encouragement to engage in conversation, students were able to complete the task given but not all peers were able to engage and reflect each other's work. Although the questions posted by Zeti were rather straightforward, many students had problems answering them.

Some students wrote they know 3types but they only name 2 soils. For the question 'Are there three types of soil? Instead of answering yes or no, students named soil.
(FN2, Zeti)

What was missing in the infusion was the lack of Zeti's pedagogical skills, where she failed to give clear directions and time limits for in-class peer discussion sessions.

Zeti: *Ok I want the paper you answered just now to exchange with the next group. We are going to check answer. mark with a colour pencil.*
Zeti: *Ok Name the three types of soil…Din?*
Din: *Clay …sand….*
Zeti: *Puteri?*
Puteri: *errr…. errr…fertilizer soil*
Zeti: *Fertilizer soil? Is there such thing as fertilizer soil?*
Whole Class: *nooooo*
Zeti: *ok nevermine…. the one is garden soil. What's the use of garden soil?*
Siti: *for planting…. teacher why are we marking today, you don't have time?*
(OBS2, Zeti)

Zeti just basically asked answer from students and told them to mark the worksheet. When students were not able to answer, she provided the information instead asking another student. Her student who gave answer wrongly quickly erased answer. Some of student's comments along the lines of: "You mean that you want me to mark her work, so you don't have to do it?" Or "She's not looking at my work she'll copy it!" Therefore, it is important that students are introduced to the concept of peer assessment carefully, as well as being given the tools to carry it out effectively. Peer assessment will not be effective until teacher have discussed, shared and developed the correct use of learning objectives and success criteria. Students need to know what they are looking for before they can identify it.

In another episode, Kala tried to engage students in groups to find some information on solar system. She sorted out the groups and gave them the subtopics. As this was the first time, she sorted smaller groups, she got very worked out and confuse on the number of groups and subtopics given. Each group was only given 5 minutes to look for information from the textbook.

Kala: *Ok now get into groups and I want you to find information about planets.*
Farid: *hmmm ….so we need to find about Jupiter…. how do we do? What do we find?*
Jasin: *err… I think we read the Textbook first, then we write some short notes.*

(OBS2, Kala)

Kala instructed students to find information but did not provide any scaffolding. She assumed that her students would read the textbook. However, this strategy did not encourage students into conversations as they were busy reading the textbook individually. Kala manage to engage students in conversation but were not able to enhance students' learning through knowledge diffusion and exchange of ideas. After 5 minute she gave another instruction,

Kala:	*Ok now you have found information, I want you to make 2 questions based on your information and get the answer! Can you understand?*
Hari:	*What make question? Errr…*
Din:	*hmmmmm…what type of questions we should make, I wonder?*
Hari:	*Can we take questions from textbook? How do we know it is correct?*

(OSB2, Kala)

Again, Kala assumed students would be able to ask questions and find answers on their own. Students needed more guidance from teacher on the task given. Kala could have use anonymous work from another class or, even better, a previous year. The benefits of an anonymous approach are that the students learn all the skills necessary to make peer assessment work successfully, without the stress that can come with trying to assess the work of other students from their class.

If peer assessment is to be effective, then students should first become familiar with the concept of peer learning. Peer learning can be defined as 'students learning from and with each other in both formal and informal ways' (Boud , 2001). Peer learning is closely aligned with peer assessment, since during the process of assessing, reviewing and feeding back on each other's work, students are also learning from and with each other.

4.2.3 Peer Assessment Infusion: Inferior

Strategies used in this category did have detrimental consequences for their students' learning. For example, even when teachers did get feedback about their strategies that confused students, the teachers did not heed to students' comments about their lack knowledge on how to procedure. The strategies were conducted haphazardly, and student learning was not enhanced as many of the students were confused.

In another episode, Ali brought his students to the computer lab for a lesson on Technology. Students were over excited due to the new environment and overlooked at teacher's guidance. However, Ali had not done the preparation well. The video that he had chosen was not playing well.

> *Students was not listening to teacher's explanation, bored as video that teacher tried to play had no volume, talking among themselves, teacher realise and stopped his explanation*
>
> *(FN4, Ali)*

After several minutes, Ali realized that his plan to ask students to pay attention was not successful, so he asked his students to Google for some information regarding Technology.

Ali:	*Ok I want you to google Technology Development and find some information about it.*
Umi:	*Teacher this one?*
Ali:	*You all ah! Does not matter, anything about technology Development! (frustrated). If found, just read.*
Farah:	*Eh how to spell ah?*
Wani:	*Hmmmm …. teacher which one we read?*

(OBS4, Ali)

Since Ali just mentioned that the students needed to Google for information, many of the students were lost on how to proceed. Although some information from the textbook was given on Technology, yet Ali was not able to make students to able to understand on the task given. Ali should be clearer on his instruction and guided students to how to look for reliable sources in the Internet. Moreover, he should have explained the rationale for asking students to search for information in groups and his expectations as well as the benefits of engaging in a peer activity process. In one group, a student questioned Ali about what he wanted them to do.

Maria: *Actually, teacher want us to find what?*
Wani: *Hmmm ... he said type Technology Development, look for information, read.*
Ali: *Ah what you all .... just find information on Technology Development and read, what's so difficult?*
Sani: *errrrr……but teacher .... (looking worried)*
Din: *Should we ask teacher, which one to choose and read?*

(OBS4, Ali)

The instruction given by Ali was too general and even when students mentioned that they were unsure of what to do Ali did not do anything to improve the situation. He could have provided prompts to help students to look for information. Students were clueless on what information that they need to find although the topic was given. Ali can create a supportive, non-threatening environment where it is safe to share thoughts without the worry that any demoralising, destructive comments will be allowed, and it is important that students feel secure.

Zeti 's Year one students were excitedly playing with clay and eagerly waiting for Zeti's instruction to start making the surface on earth model.

Zeti: *ok class, look at the textbook, under topic earth's surface there is a picture. Just follow that and make.*
Puteri: *hurray we can start ready ...*
Farah: *hmmmmm ... (looking blur) where do I start from?*
Zeti: *Ok class stop ... listen first. First you can sketch the drawing on the paper plate, than put the clay I see some of you putting everywhere! (angry).*

(OBS4, Zeti)

Zeti planned for her students to make the model and at the end of lesson to talk about it and comment on their peers' model, unfortunately students were not able to even understand her instruction on making the modal. When questioned why she felt that her students were unable to understand her instructions, Zeti begin to compare this

class with one of her better classes and put the blame on the students inability to concentrate.

> *Ehhhhh … As I told just now, I have done another class. They can do themselves and did fast and good work. See I want to apply for this class also it is a simple activity, they cannot do themselves and always play with the dough!*
>
> *(I4, Zeti)*

As Zeti walked around her class, she was rather upset and told students what to do instead of holding discussion and findings out what the students were trying to do and how she can support them. After walking around the classroom …

Zeti:	*Class listen, please stop, ok why this simple instruction you cannot follow? What we need to do first?*
Whole class:	*Draw*
Zeti:	*ok then put the clay , blue for lake, green for mountain …*

(OBS4, Zeti)

Even after several explanation and guidance given, Zeti's students were still struggling on making the model. Some could not even draw and refuse to ask their peers help. The peers that were able to do themselves too did not give any help. Zeti was getting frustrated as it was very difficult to engage students into a conversation.

Zeti:	*Ok class I really do not know why this simple method you cannot do! Ok all of you stop and choose a friend on your own and do.*
Zeti:	*Eh wani do you think what Puteri doing is correct … we use green for lake?*
Wani:	*Err … (looking stuck)*

(OBS4, Zeti)

In this episode, Zeti could not manage to engage students in making their own learning fruitful. Only a handful of students were able to make the model partially. The rest were still depended on the teacher's specific instruction and guidance. Even when

Zeti gave instruction to choose a friend and complete the task, students yet still hesitate on where to start and how to continue.

Zeti: *Dania come see ... Farid has mixed all colours ... is this correct?*
Dania: *Err…no …but…teacher…*

(OBS4, Zeti)

She also tried to make students to give review on their peers, but her students were hesitating to give any feedback and kept silent. Asking students to make judgements on others' work can be a little daunting. By using this technique, Zeti needs to focus more on the positive. She could have asked her students to comment on the positive things that their peer had done and give one suggestion on how to improve. Zeti could have used an to use anonymous work from another class to do peer review. This could have reduced stress that can come with trying to assess the work of other students from their class.

The quality of teachers' infusion on peer assessment depended on the strategies. All teacher did show a variety of infusion of these strategies. Since peer assessment strategies depended on various factors: students, resources and topic taught, teachers' practices were also varied. In this study, teacher's infusion of peer assessment could be categorized as 'impressive', 'intermediate' and 'inferior'

4.3 Challenges Faced when Infusing Peer Assessment Strategies

To answer research question 2 about the challenges teachers faced when infusing peer assessment strategies, four themes emerged for this study. The themes were *'Perceived pressure of time and work', 'Reluctance to change*', *'Language proficiency'* and *'Routine and boredom'*.

4.3.1 Challenge: Perceived Pressure of Time and Work

Zeti had the experience of teaching science and she had conflicting ideas about peer assessment. Even though, she is aware of the benefits of these strategies in terms of student learning, she felt she did not have the luxury to infuse them in her lessons as it took up too much time of an already busy teaching schedule.

> *"Considering the benefits, I may want to do more peer assessment in the classroom, but I have a textbook to finish and a curriculum to follow. There is even not enough time to finish these. Peer assessment needs more time in classroom. Must discuss with students why they gave those grades etc. Yet I do not have that much time"*
>
> *(I5, Zeti)*

Kala talked about how involving students in the goal setting, constructing criteria that they could use to know how well they were meeting these goals, impacted her peer assessment strategies.

> *"Yes, the first attempt was really stress. Usually when I try to have student centred classroom, I will end up giving them everything especially when we are questioning, I will question more but I have never tried students questioning. So this time I tried where I ask the students to initiate the question and the students this is new for them for they are a bit blur and the classroom a bit bored ...I also feel a bit stress and bored because I have to wait for students to throw the question. But after like a few attempts think like got some improvement where the students know what they supposed to do."*
>
> *(I5, Kala)*

In contrast, Kala felt that time and resources were not critical issues as compared to the time used to manage her students while doing these strategies. She felt that additional resources needed to infuse peer assessment strategies could be brought by the students themselves. An example would be that for presentations, students can bring markers, manila cards or papers. Even teachers could bring in items needed especially for science experiment or presentation. Could be brought by the teachers.

Ali particularly noted how looking for many resources has impacted his peer assessment strategies.

> *I found that peer assessment was helpful. I want to search for more materials, initially I feel pressured in preparing materials for all students. If group than it is ok but if peer I need to prepare more. It is not the material but the quantity of material. Sometimes students also do not cooperate when we ask them to bring materials. Basically, we need to prepare everything."*
>
> *(I5, Ali)*

Ali added that the school does not support the purchases of items if they want to do peer assessment. For example, if students want to do a project, he claimed that each group would need to do a slightly different variation so that when they assess their peers, they would concentrate as the project is something new. However, when he asked his students to bring items from home, many would not do so. Sometimes, he said he would like to have videos, to show students how to evaluate their peers, he claims that many videos are focused on the subtopic that he is planning to teach. Even if he searches through internet, sometimes the videos are not meant for general view and the videos are also not specific.

4.3.2 Challenge: Reluctance to Change

Kala strongly said it was very difficult for her to change as she views herself as the knowledge provider.

> *"Hmmm….err…I think is we stick to our old fashion teaching for*
> *example like myself sometimes I don't really try to a new one. I have tried a new one but very general and comment not something radical. So I feel this one a bit radical especially pair works we seldom myself do pair work to students because I feel in pairs they won't get more ideas so I feel if they are in big group better maybe this is what my believe."*
>
> *(I5, Kala)*

Kala added that her students were not interested to change, and this compels her also not to change her pedagogical skills. They students are exam-orientated and would only comply if it is related to examinations. Moreover, since they have always seemed her marking their papers, they feel awkward when are asked to do it. added on her students ask her questions about the exam all the time.

Kavita feels that peer assessment strategies are not suitable for our educational system. Her students want to know what grade she would give them rather than their friends' grades. Classroom observation indicated that students frequently and sometimes at lightning speed ticked the "good" option for each criterion. Kala commented she feels that students might just doing it, in the sense that it is just another form to fill in, tick the boxes and get on without seriously considering the work. So, even if she allows her students to give a grade, it might not be reliable.

Ali commented how he had noticed; he was teaching based on how he was taught when he was in school. He claimed that teachers then would always give the answers, thus, he feels that he should be doing the same too. His training also prevents him to infusing peer assessment strategies as he has no confidence and was not taught about peer assessment.

> *"I teach as what I was taught during my training as teacher being the knowledge provider. So, when suddenly I was told that I can give autonomy to students, hesitated at first. How am I going to prepare all these activities? Will they understand? I am used to getting information for students and make them copy notes."*
>
> *(I5, Ali)*

Ali mentioned that some of his students enjoyed peer assessment, but most of them do not take it seriously. Peer assessment turns into a regular chit chat after some time. He feels he loses control of his class. Peer assessment is learner-centred, but what he does in class is mostly teacher-centred. He feels he needs to overcome this problem

first. Ali also have trouble on how to help his students to give feedback. For example, one of student always just gives "very good". Thus, when they compared their peer's comments with Ali's he said "Mr Ali's comments are good. Because he is a teacher, his comments are different from our comments." Overall, Ali feels when students are still giving preference to teacher's comments compared to learn to value their peers, a change is still questionable.

Zeti agreed that involving her students in their own evaluation was difficult and restricted by her school from carrying out such approaches all the time.

> *"As being an experience teacher yes it was difficult for me to take in new ideas. I was thinking whether it is going to work for my students or not. Will my students be able to do? What if they do not understand? Even if they do is the school going to adopt these practises? How are they going to pass the examination? All these questions were running in my head."*
>
> *(I5, Zeti)*

Zeti expressed she would like to have had the students to set the success criteria themselves. Rather than her saying "this is what She want to see, this is what they have to achieve", she would rather have the students to say " well this is what I think a good model would look like"…She would like to have the students to have more say in the assessment and that way they would have a better understanding of what is expected. As Zeti's students are in lower primary she feels it is difficult for the students to go through a change as there are still young. During the classroom observations one of Zeti's students commented that it is hard to write comments. If they write something bad, their classmate may be upset. Here Zeti feels it is not easy to bring a change when students' emotions are involved as students perceive this as something negative. In addition, parents and school authorities not very favourable of peer assessment or

formative assessment. She claims that they still looked at end marks and grades given by a teacher is what is valued.

4.3.3 Challenge: Language proficiency

In general, teachers view on peer assessment strategies varied depending on their own students perceived language proficiency. One of the teachers, Zeti provided in detail how and why participating in peer assessment strategies at school had made her carefully consider involving students in their own assessment.

> *"Most students cannot give correct grades or feedback to their friends because they do not have enough proficiency themselves or their language level is not enough to express themselves correctly, what more giving a mark? How can I trust their judgements?"*
>
> *(I3, Zeti)*

Furthermore, Zeti commented on the classroom scenario. Students were put into smaller groups in classroom. There were four students and they each took turns to do the experiment with a set of criteria that had to judge or mark. Students had a huge problem with that whole experiment. Some felt they were not qualified to enough in language to be able to do that properly. They can give feedback in a simple form but do not feel comfortable about giving a mark.

She feels peer assessment is a very powerful tool in the classroom, but she might need to use it differently.

> *What should have happened is students could have done their experiments and could have provided feedback, not given a mark. Much much better although their language proficiency is not good, but they would have incorporated in learning."*
>
> *(I3, Zeti)*

She shared on of the students view in her classroom after several lessons using peer assessment.

> *"My student said he likes peer assessment because his grammar is very poor, if he gets his peers to correct it, he can learn something"*
>
> *(I4, Zeti)*

Kala also commented that language either spoken or to express scientific terms are rather difficult for some students to master.

> *"My students who assessed work completed by peer of higher language proficiency expressed discomfort with the task because they could not identify errors or would simply assume that their more proficient peer was correct."*
>
> *(I3, Kala)*

Kala explained that high language proficiency students found that their less proficient peers could not infuse the feedback they offered and could not provide useful comment. She also added on most students lack in grammatical knowledge which could help improve their work. She gave examples of one of her student's concern

> *"If I have a better friend who can speak well sitting next to me, I will really look at the feedback very seriously, because she can give real comments. ... If I have a friend, who has a lower language level, and I teach her, but she does not know how to teach me, then I won't benefit, not fair"*
>
> *(I3, Kala)*

Ali believed this type of concern could happen across all level. He expresses some students engage themselves in the process although the language proficiency is low and found it useful, whilst others become somewhat frustrated if they thought their peer was not supplying useful comments.

> *"It comes back to knowledge. If you are not very good at tenses and you think it might be wrong, it might be hard to recognize an error."*
>
> *(I2, Ali)*

Kala added that students may feel inferior if their do not have good communication skills.

"If the other person knows that you are wrong, you will write carefully next time. You don't want to be laughed at"
(I3, Kala)

Kala stated that some of her students were motivated to give feedback if they were sure that their peers would take the feedback given seriously. For some students, peer assessment strategies instilled a sense of competition. When they see there is something wrong with other's work, they feel happy because it means that they are better than the other.

Ali shared in the interview session that the students found peer assessment "interesting" as long as they received "a quality comment". However, Ali said if a student believed that her peer "cannot give her the quality comment and that she won't enjoy it". He also shared his idea that it was a challenge to make students receive useful and varied feedback was the physical space in the classroom and more accurately the seating arrangement. He informed that sometimes the homeroom teacher, not the Science teachers, paired students at desks. Consequently, students tended to receive feedback from the same peer, regardless of language proficiency.

Overall language proficiency carries a weight in affecting students' ability to give and receive quality feedback. While some teachers saw value in looking peer's work, perception of the quality feedback determined the overall response to peer assessment strategies.

4.3.4 Challenge: Routine and Boredom

A further challenge explored is the dilemma of how teachers provide enough practise of peer assessment while avoiding routine that may cause boredom among their students. Ali expressed that prolonged peer assessment strategies may create some sort of routine and students may get bored of the strategies.

"The first time they feel, 'Wow' The second time, Hmm, I can do this.' The third time, 'I can do it with confident' The fourth time, 'It's boring' The fifth time, 'I want to sleep"

(I5, Ali)

Other teachers supported this view, suggesting that once they understood how to do peer assessment it became dull activity for them. Within the twelve times peer assessment was carried out during the four months period of the research, the teachers used peer assessment for varied types of experiments, presentations, but the students commented that they easily became bored with routine. Kala also acknowledge this:

"Like with any task, the first time you're not quite sure how to do it, the second time you can do it quite well. There's got to be a balance between allowing the students to practice enough so that they can do a good job and at other extreme, oh no here comes another peer assessment again."

(I5, Kala)

There is a similarity between the teachers' comments, in the interviews, the teachers suggested various options to improve their peer assessment experience. There would be greater variety in the form's presentation by adding colour and drawing, a possibility also noted by both other teachers. However, Zeti being frustrated teaching her younger students stated,

"Even if they change the form to a very colourful one and add a lot of pictures, when they looked at it a long time, they will still be bored by it."

(I5, Zeti)

Zeti noted that feedback could also be generated in alternative ways. Peers could assess easier tasks, but the teachers, who students considered more able to give useful feedback, could assess more challenging tasks. She also added, pairing with different peers would facilitate receiving feedback from peers of both high and low ability. More variety, they suggested, would make peer assessment more interesting.

Kala also reflected on whether peer assessment infusion needed some modification.

> *"I think we need to change it up a bit. Maybe I tend to on the side of competency rather than interest. That is a challenge we need to look at, whether it means just designing an experiment differently or having some verbal discussion rather than always completing a worksheet at the workbook. Maybe even by asking the students 'what's another way we can do this?' We can empower them to help with that."*
>
> *(I5, Kala)*

Kala feels once it had become a routine, the processes of peer assessment needs some change. As her students were at the upper primary schooling, Kala motivated her students for engaging in many peer assessment strategies. Towards the end of the month of the research, students began to prepare for final examination at the school. Kala encouraged her students to review the previous feedback for peers and peer assessment activities.

> *"I feel this can improve students' goals just prior to practice test was helpful and extended their range of revision strategies beyond rote-learning and memorization."*
>
> *(I5, Kala)*

Ali also reflected on this believes what has seemed boring now can began to appear exciting. He feels previous feedback could be used to anticipate challenges and increase skills developed in conducting experiments and presentations could be applied to self-assessment during the examination.

4.4 Summary

Finding shows three science teachers have infuse peer assessment differently depending on the activity, students and their capabilities, faced various challenges throughout this study yet they felt peer assessment has changed their teaching learning towards a better way. In the next Chapter, discussion on the findings, summary, conclusion and implication of the study will be discussed.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

The study investigated how primary science teachers infuse peer assessment strategies and the challenges they face when infusing the strategies. In this chapter, the following aspects will be discussed: (i) the summary of the findings; (ii) the discussion of the research findings which further describes the findings and relates to the past literature; (iii) implications of the study and (iv) the conclusion.

5.2 Discussion of the Findings

Discussion on selected primary science teachers' infusion of peer assessment strategies in the classroom

The main thrust of this small-scale study was to explore primary science teacher's infusion of peer assessment strategies in classrooms. In relation to the first research question, the findings indicate that teachers manage to infuse peer assessment strategies in various capabilities. When teachers were able to infuse the peer assessment strategies overall in their classrooms with less issues, sorted as 'Impressive', and manage to infuse with some issues, sorted as 'Intermediate' and difficult to infuse, sorted as 'Inferior'. Issues here referring to from various aspects such as students' capabilities and willingness, teacher's willingness, time and resources, classroom environment and many more. All the three teachers had positive opinion on peer assessment in terms of students were able to learn from each other and being encouraged to take responsibility for their own work. As this study was carried out, teachers were able to construct new knowledge about teaching and make changes to their existing teaching practice. When students were not able to receive useful feedback from their peers, teachers felt peer assessment was less favoured and, in this

case, students tended to prefer teacher feedback because it was more authoritative. These are parallel with (Rubin, 2006) teachers assumed that students would resist and will not cooperate in the process of peer assessment.

Moreover, in this study teachers believe that summative forms of assessment are more time efficient and have more value because they serve summative requirements and accountability demands. Even if science teachers appreciated the potential of peer assessment to positive influence student achievement, there are concerns that peer assessment demands too much class time to infuse and that it may limit the amount of curriculum teachers can cover within their school hours, a line with (Blatchford, Kutnick, Baines and Galtin, 2003). Teachers believe peer assessment was good in theory, but that it was not practical to infuse, especially within a context of competing curriculum demand.

Peer feedback as part of peer assessment strategy was considered inadequate by the science teachers because it was insufficiently critical, or the peer lacked the requisite knowledge among their students. The finding that students tend to value teachers' opinions more than students is consistent with previous studies assumption between belief and practice (Hermans, 2008). The teachers' view of the classroom processes of infusion peer assessment strategy were generally like students, in itself a finding worth highlighting. Teachers also viewed peer assessment as a useful component of a process approach to conduct experiments and presentations, and a wider skill that students needed to monitor their own work and become more empowered learners.

Classroom observations indicates that science teachers managed to change their normal whole class interaction to smaller group with peer assessment strategies. One of the science teachers mentioned that smaller group peer activities were

beneficial as it gave students the chance to discuss the concept with their peers. However, sometimes the teachers took charge of providing the correct answers and students seemed anxious to ensure that they got the right answers but erasing the wrong ones. Though the teacher attempted to use the strategies but their s beliefs as knowledge provider seem prevalent. The ability for teachers to allow students to be more active in their learning seems rather difficult to be carried (Davies, 2000; Ho & Savignon, 2007; Kaufman & Schunn, 2011; Liu & Carless, 2006; Roskams, 1999).

In the study findings show that some science teachers have been practicing peer assessment strategies especially the questioning technique instead of giving the answers, but they never tried giving the autonomy to students to make the questions and question their peers. For instance, one teacher seems hesitant to give student autonomy when the students were doing their presentation. The teacher kept interrupting and taking control of the students' presentation and during their question and answer time. As mentioned in (Gillies & Boyle, 2010), teachers need to have the confident to give autonomy to students and to any challenges that arise from that. Thus, more external support in the form of practical collaborative professional development can be introduced to science teachers to conduct effective peer assessment and likely to see the positive impact of these strategies.

In contrast, some teachers although had less experience compare to the other or reluctant to change, thus willingness to carry out the peer assessment strategy in the classrooms was not a challenge personally. The challenge was usually from external aspect and soon it demotivates the teachers. As explained in the findings, the teachers managed to initiate the strategies and engage students in their science lessons. The students got excited with the new activities as they initiated and developed the strategies. The discussions among teachers and students also revealed that the students

involved in the activities, no matter it was simple, moderate or challenging activities. Sometimes the capabilities of students such as language proficiency became challenges as indicated in the findings (Bryant, 2010).

The classroom observation infusion of peer assessment strategies also revealed that the science teachers contributed actively regardless the challenges and made students engaged in each other's ideas. These are parallel with the findings of the study conducted by (Butler, 2004). The addition of ideas during the peer discussion shows their genuine engagement in the discussion and not for the sake of attempting to join just because it was instructed by teacher. (Gillies & Boyle, 2010) supports this findings peer assessment can provide student positive effectiveness and undoubtedly provides students with an interactional experience in their learning process.

Conversely, the findings of the current study are parallel with the view of Meaningful Learning Theory that when the teachers instruct students in pairs, the tendency to involve in turn- taking is higher and this allowed the students in the current study to engage in the process of developing autonomy. This clearly shows that discussion through peers, together allowed students to jointly construct ideas which in turn enabled them to come to a consensus (Vygotsky,1978). Additionally, findings of the current study also revealed that the science teachers manage to make students produced more answers in peer assessment activities. However, the student's engagement in the classroom activities using peer assessment strategies was good, yet some teachers found that eventually after some repetitions the students become bored and not willing to cooperate.

Discussion on the challenges faced by the selected primary science teachers when infusing peer assessment strategies in the classroom

The second research question focused on the challenges arising from science teaches infusion of peer assessment. Probably the most critical challenges related to the finding that whilst peer assessment is a skill that needs repetition and practice, after students had carried out multiple iterations, they develop a sense of over familiarity. Regardless the level of classes the science teachers was teaching, this results in boredom, a challenge also noted in (Carless, 2005), and confound teachers' attempts to engage students in the manner they thought necessary to promote proficient peer assessment skills. Whilst the literature advocates sustained engagement with peer (Bryant, 2010), the way the teachers infused in this study showed that there is risk that students' interest will wane unless sufficient variety and challenge is introduced. Most teachers felt, more positively, peer assessment stimulates self-monitoring habits that might become increasingly important to students as their learning careers evolve. In this sense, a relatively short-term study such as the current one is unable to probe possible longer-term benefits of engagement with peer assessment.

These findings show that the science teachers demonstrated through their responses that infusing include students in peer assessment was not straight forward and that more could have been done to assist them in seeing and understanding how to infuse such practices. Language proficiency among students was a great challenge for science teachers to infuse peer assessment strategies when they had to make students give feedback for presentations or experiments (Bryant, 2010) Despite this, some teachers felt giving feedback in a simple way was much better than making students to mark a worksheet.

In line with previous studies (Deluca, 2012; Hill, 2013), having a classroom assessment course that teachers about such practices important as well as intertwining peer assessment with other courses. Teachers confirmed that peer assessment

strategies were helpful and suggested that doing this more often would help in their teaching and learning. They also indicated that even when their experiences in peer assessment strategies in classrooms was not completely successful to what were needed to do, these experiences provided food for thought, expanding and developing their ideas about peer assessment.

Although teachers had expressed, students boredom with peer assessment, supported with finding (Black, 2003) interest in the practice was infused towards the end of the study as teachers realized that it could help them prepare for examination. In doing so, peer assessment may encourage and move beyond examination preparation techniques based on rote learning and memorization which teachers felt perceived pressure of time and work was a challenge in the findings. For instance, through peer assessment teachers learn to prepare students to identify in advance the types or errors that they would be most likely to make in examinations and develop strategies to rectify them.

At the outset of the study neither researcher nor teacher s had anticipated that any explicit connection would be made between peer assessment and summative assessment. These connections emerged relatively late in study process in response to the approach of year end examination at the end of primary schooling, and an awareness of the potential of peer assessment for examination. This finding suggests how peer assessment strategies can be adapted to suit the needs of a particular local settings and reinforces (Kennedy et al.'s 2008) point that formative assessment cannot be treated in isolation from, or as an antidote to, the dominance of summative assessment.

Following from this, a contribution of the study lies in indicating how peer assessment strategy is mediated and modified by interacting with the setting in which it is infused and may changes the challenges science teachers had throughout their infusion on peer assessment in classrooms. As to classroom view, the findings indicate that teachers at upper primary pay more attention to peer assessment during the study. A possible explanation is that teachers in the lower primary perceive their students as to young. Further, it is also possible that teachers in upper primary increase their efforts in peer assessment as away to prepare them for the transition to secondary schools, where students are expected to behave in more independent way (Dembo & Eaton, 2000).

5.3 Implications of the Study

Even though this study investigated only three teachers, the implications of this study are numerous and involve teachers, students and teacher educators.

5.3.1 Teachers

This study revealed that not all peer assessment strategies are easy to infuse into teachers' daily lesson. For the example, Kala did provide a better infusion of peer assessment strategies. However, her infusion of the strategies was not always successful. This is because teachers must be aware and knowledge about these strategies and know when it is best to infuse the strategy. Teachers must now look at students as their co-learners and get students involved in the process. The teachers must look seriously to reduce the power distance between teachers and students so that students will feel safe to play a prominent role in the learning discourse.

Even though there were three teachers in this study the researcher found the teachers infused variety of peer assessment strategies in their science classrooms. Therefore, it becomes a challenge when policies are created from top down as they

have different impact on teachers' implementation of that policy. Teachers can compare their strategies with what has emerged from this study and see how they can improve.

5.3.2 Students

Students who are exposed to teachers who implement peer assessment are empowered to take ownership of their own learning. These students are actively involved in their learning. This is because when teachers ask students to give feedback to their friends, students must first internalize what they have learned before providing peer feedback. This would encourage a deeper understanding of the content and enhance skills like communication and collaboration. The interdependence of students to achieve much meaningful learning because students can use each other as resources. When students are more confident in their learning, they would be autonomous learners.

5.3.3 Teacher Educators

Formative assessment has proven to upgrade student learning at all levels. As such future teachers would need to learn about formative assessment strategies. Peer assessment is one of those strategies. This study has proven that teachers struggle to infuse peer assessment and as such it would provide information on how teacher education programmes can include content matter about how to infuse these strategies. It would greatly help future teachers when give autonomy to their students when teaching.

5.4 Conclusion

The effective infusion of peer assessment strategies needs substantial efforts of educational stakeholders. It is believed that peer assessment largely depends on the quality of teacher's capability to develop student interactions. Peer Assessment

strategies used in this research may emerge when teachers work collaboratively with students and most of the strategies used are productive based on the teachers experience in teaching and learning. Consistent peer assessment practice, with the support of external expertise may lead to development of autonomy learners much needed still for the two-first century learners.

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