THE IMPLEMENTATION OF PRIMARY SCHOOL SCIENCE FLIPPED CLASSROOM IN SABAH: A CASE STUDY

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FAKULTI PSIKOLOGI DAN PENDIDIKAN
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DECLARATION

I hereby declare that the material in this research is my own except for quotations, equations summaries and references, which have been duly acknowledged.

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At the time this dedication was written, I felt very relieved that the writing in this research was nearing the end of its success. I feel very, very grateful to Allah, who gave me His grace despite all this hard work.

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ABSTRACT

The flipped classroom is one of the approaches used in 21st-century teaching practices. Contrary to primary education, various literature on the flipped classroom approach was studied in the secondary and tertiary education levels. The study's literature comprised the sociocultural theory, constructivist theory of learning, zone of proximal development (ZPD), scaffolding in learning and models, and past studies on the flipped classroom. Based on the literature, some problems such as lack of science learning time in the classroom, lack of active learning, and lack of ICT use in learning can be mitigated by implementing a flipped classroom. Since the literature on primary school flipped classroom is limited, findings are needed. Thus, continuing the contribution to the body of knowledge, this research aims to explore the main themes in conducting a flipped-classroom approach in the context of primary school science. From the selection of teachers and learners, interviews, classroom observations, and document reviews were analysed systematically. Four schools were involved in this study. There were four teachers and twenty learners who have experience with flipped learning and agreed to be the informants. This study used within-case data analysis to analyse the four cases one by one, followed by cross-case data analysis to compare and contrast the four cases' findings. The findings reveal six themes in primary science flipped classroom implementations: pre-class session, in-class session, post-class session, affordance and assistance, barriers and mitigation plan. There are various aspects taken into consideration from the teacher and learners to implementing the flipped classroom. The teachers realised that although flipped classrooms helped them conduct the lesson in many ways, they need to resolve barriers. Indeed, the flipped classroom has promoted science learning through active learning activities in the classroom. At the same time, ICT is supplementary rather than compulsory. These findings provided a foundation for preliminary direction in implementing the primary school science flipped classroom and other researchers to do further study.

ABSTRAK

IMPLEMENTASI* FLIPPED CLASSROOM *SAINS SEKOLAH RENDAH DI SABAH: KAJIAN KES

Flipped classroom adalah salah satu pendekatan yang digunakan dalam amalan pengajaran abad ke-21. Berbeza dengan pendidikan rendah, pelbagai literatur mengenai pendekatan flipped classroom digunakan di peringkat pendidikan menengah dan tinggi. Kajian literatur merangkumi teori sosiobudaya, teori pembelajaran konstruktivis, zon pengembangan proksimal (ZPD), scaffolding dalam pembelajaran dan model, dan kajian lalu berkenaan flipped classroom. Berdasarkan literatur, beberapa masalah seperti kekurangan waktu pembelajaran sains di dalam kelas, kekurangan pembelajaran aktif, dan kurangnya penggunaan ICT dalam pembelajaran dapat diatasi dengan melaksanakan flipped classroom. Oleh kerana sumber literatur mengenai flipped classroom di sekolah rendah adalah terhad, penemuan ini diperlukan. Oleh itu, meneruskan sumbangan kepada sumber pengetahuan, penyelidikan ini bertujuan untuk meneroka tema-tema utama dalam melaksanakan pendekatan flipped classroom dalam konteks sains sekolah rendah. Bermula dari pemilihan guru dan pelajar, temu ramah, pemerhatian, dan tinjauan dokumen telah dianalisis secara sistematik. Empat sekolah terlibat dalam kajian ini. Terdapat empat orang guru dan dua puluh pelajar yang mempunyai pengalaman tentang flipped classroom dan bersetuju untuk menjadi pemberi maklumat. Kajian ini menggunakan analisis data kes berasingan untuk menganalisis empat kes satu demi satu, kemudian diikuti dengan analisis data merentas kes untuk membandingkan dan membezakan penemuan empat kes tersebut. Hasil kajian menunjukkan enam tema dalam sains sekolah rendah melaksanakan pelaksanaan flipped classroom: sesi pra-kelas, sesi dalam kelas, sesi pasca-kelas, kemampuan dan bantuan, halangan dan rancangan mitigasi. Terdapat pelbagai aspek yang diambil kira dari guru dan pelajar untuk melaksanakan flipped classroom. Para guru menyedari bahawa walaupun flipped classroom membantu mereka menjalankan pengajaran dengan banyak cara, mereka perlu menangani halangan tertentu. Tuntasnya, flipped classroom telah meningkatkan pembelajaran sains melalui aktiviti pembelajaran aktif di dalam kelas. Pada masa yang sama, ICT adalah tambahan dan bukannya kemestian. Penemuan ini memberikan asas untuk petunjuk awal dalam melaksanakan kelas sekolah sains sekolah rendah dan penyelidik lain untuk membuat kajian lebih lanjut.

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CHAPTER 1

INTRODUCTION

1.1 Chapter Overview

Today's world shows that learning outside the classroom is a new norm with the aid of distance learning through the digital world (Santos & Serpa, 2020). The learners need to have responsibility for their learning aided by the teacher's support as a moderator. Findings from Dancy and Henderson's comprehensive framework reveal that most Malaysian science teachers used the traditional instructional practice (Tay & Saleh, 2019). The teachers used the traditional instructional practice to teach science, and this situation caused the learners to learn passively, such as listening to lectures. In Malaysia, science education emphasizes the development of some aspects: science knowledge, scientific skills, and scientific attitude among learners (Darus & Mohd Saat, 2013) besides applying the higher level of thinking skills to solve problems. These crucial aspects need to be combined with a more effective way of science teaching. Science teaching modification and enhancement are needed to comply with the national current curriculum changes (Mahmud et al., 2018). The way teachers deliver content knowledge in the class is as usual, traditionally without fundamental changes but can be improved with the application of flipped teaching (Santos & Serpa, 2020). The flipped classroom is an approach the teacher uses nowadays to teach science differently. The flipped classroom approach has been increasingly used in Malaysian education (Fatimah Abd Rahman et al., 2019a). Through flipped classroom approach, the learners learn the lectures at home and do learning activities at school. Educators benefit from the flipped-classroom approach to promoting their learners to learn actively. In Malaysia, the flipped classroom and blended learning are steadily developing and being implemented over time due to their flexibility and versatility in practice (Soon Tan et al., 2022). However, the literature resource of flipped classroom implementation is limited for primary science education.

1.2 Primary Science Education in Malaysia

Science subject is a core subject in primary school. There are series of curriculum modifications on the primary science syllabus to enhance and adapt the learning contents to the learners' context. This adaptation also served as a plan to encounter the uncertainties on the national's Trends in International Mathematics and Science Study (TIMSS) achievement and prevent any further dismal performance in the future. Nevertheless, these upgrades are mainly on the primary science syllabus and, unfortunately, less on the pedagogical approach. The way of teaching by most of the primary teachers remains the same. The same issue was still being discussed scholarly. For example, some teachers and students still face problems implementing higher-order thinking-based teaching and learning (Hassan et al., 2017).

Recently, it was emphasized that the teachers must find ways to implement active learning in the primary science teaching and learning session. This active learning approach should be made inside and also outside of the classroom. Nevertheless, active learning can be challenging outside the classroom setting. Even though most primary pupils can learn more at home, they will always end up just finishing their homework. Although parents may monitor their child's learning hours at home, it was found that the parents' support was still inadequate in promoting their child to be a self-regulated learner (Manukaram et al., 2013). In addition, some parents were also having difficulties helping their children understand the topic during home study. This issue is due to limited background knowledge, especially for parents in the rural area as (Ab Latif Asyraf & Abdullah Norazilawati, 2016) concerned. Moreover, learning in isolation may lead to difficulties in learning new topics, as students will have no proper preparations for their next class learning session.

An almost similar scenario happens in a typical primary school whereby most students lack the opportunities to have a new way of discovering and acquiring science knowledge. Most would rely on textbooks and did not have the intrinsic will to search for more information independently. They are still out of the 'need to know'

attitude zone as they were still stuck in the 'because it is only needed for the test' zone. Some learners believe that learning science is only learning what the teachers told them (Tugurian & Carrier, 2016). In other words, they are merely studying what the teachers had fed. Learning information is only based on textbooks, and less hands-on activity is being conducted. Students will be less interested in learning science in long-term learning due to the lack of meaningful learning experiences. Therefore, such passive learning should be avoided so that the primary school's positive attitude toward science will not degrade in the 7th grade (Mihladiz et al., 2011). Intentionally, schools should be paralleled to the global science education goal to develop positive attitudes towards science (Yin et al., 2016).

Some teachers may choose group discussion as an alternative to mitigate time constraints in handling active learning discussions. However, it was found that group discussion was still not compelling enough, as stated in the following cases. In mixed ability year four primary science classes, some teachers preferred to conduct the whole group discussion rather than the small-group discussion. This has become an issue as they noticed that small group discussions were more time-consuming than individual learning and cause an inappropriate learning discipline problem such as a noisy classroom (Row et al., 2016).

The incorporation of ICT can be beneficial to teaching and learning activities. Having the ICT facilities in learning is a bonus for the students and the teacher. This additional teaching tool was proved to positively influence the achievement and motivation among the year four students learning primary science subjects (Azidah Abu Ziden, Ismail, Robitah Spian, & K.Kumutha, 2011). In the context of the Malaysian primary schools, 90% of the government primary has Internet connectivity through the 1Bestari Net project (Pawelcyzyk & Karam Singh, 2014). This number indeed has been proliferating until now. However, teachers are still facing more interactive learning problems such as blended learning classrooms due to the latest Malaysians' computer to learner ratio (UNESCO, 2016).

Based on the issues discussed in previous paragraphs, an active, intrinsic, collaborative, and exciting teaching and learning process is needed in primary science

education. Primary educational innovation is crucial as the prime foundation for secondary and tertiary education in Malaysia. Hence, analyzing some problems occurring in our primary science education, a new teaching and learning pedagogy is the main point of interest to be investigated. Students learn actively with a solid inner motivation in a more exciting and meaningful way to be encouraged to become self-regulated learners. This issue is also to ensure that the students' positive attitudes towards science.

1.3 The Use of Technology in Malaysian Primary Education

Technology usage in Malaysian primary schools is essential to promote effective teaching and learning (Simin & Sani, 2015). The use of technology in primary school can be influenced by the facilities and the infrastructure development (Judi et al., 2011). The urban and rural area of primary education differs in term of the facilities equipped at the school and the lifestyle of using educational technology. It was observed that the urban schools have a more advanced way of securing better technology usage in facilitating the teaching and learning activity. Most urban area schools have excellent Internet connectivity to benefit the online learning medium such as the 'Frog VLE.' Even so, the teachers face some barriers to implementing this teaching and learning platform. The barriers include their school's workloads that prevented them from mastering the e-learning platform, limited ICT skills, low English proficiency, and the e-learning for large class management skills (Cheok et al., 2017).

Despite that, the ministry had supplied primary schools with teaching tool which can help interactive teaching such as LCD projectors. However, most schools have technical problems (Simin & Sani, 2015) due to the malfunctioning ICT equipment (Sandra et al., 2013). The maintenance procedure was not accessible by just sending the equipment directly to the repair shop. Teachers are still unsatisfied with the maintenance services (Puteh & Salam, 2012). There would be some complex procedures to follow and an uncertain period to repair or replace the equipment. Most schools only have at least two or three LCDs to be used by more than four

classes every day. This situation is another matter that demotivates the teacher to use the only easy-to-use technology at the school.

Focussing on primary science education, one of the national education programs to enhance science and mathematics education is the Teaching and Learning Mathematics and Science in English (PPSMI) program. The ministry had supplied the school with the PPSMI teaching and learning modules and tools. The program had positive feedback from the students and the school community (Yasin & Sarih, 2010). However, findings revealed that the program failed to contribute to science and mathematic learning (Haron et al., 2008), leading to the supply was halted after the program. The PPSMI program was abolished due to the changes and reverts in the latest curriculum.

Nowadays, science teachers are asked to integrate teaching with the STEM elements comprised of science, technology, engineering, and mathematics (Mahmud et al., 2018). Specifically, technology in education is becoming more critical to improving the teachers' and students' efficiency, ICT literacy, making learning more enjoyable, and improving student self-achievement and self-learning (Pawelcyzyk & Karam Singh, 2014). Mainly, in primary school, the use of educational technology benefits both the teacher and the learners. Technology usage such as ICT acts as a supplementary in learning activities that promote efficient knowledge transfer and interactive learning activities.

Besides, the ministry has requested educators to benefit from the use of technology in teaching and learning sessions (A. A. Rahman et al., 2014a). The use of technology in education, especially in primary science education, was a complementary aspect of the learning syllabus. This issue can also be seen in the primary science textbook provided at the school. There will also be a specific time or topic that the teacher would teach the students to use the technology in learning. The students and the teacher would either go to the science laboratory or the ICT room to gain technology access such as the computer, Internet, interactive CD, audio and video tools, and the LCD projector equipment. Nevertheless, this is only for the learning activity inside the classroom.

On the other hand, teachers should promote more active learning outside of the classroom. Indeed, there are many suggested approaches in 21st-century teaching and learning pedagogy. One of the current practices is flipped classroom approach. Using this approach, the student will learn at home and accomplish the learning activity at school. The teacher will give the students some guidance and related information for the students to learn. The flipped classroom was successfully conducted at the higher education level (Archana Singh Sikarwar, 2015).

1.4 Problem Statement

Based on the 2nd wave of the Malaysia Education Blueprint 2013-2025 (PPPM 2012-2025), the teachers need to effectively implement the new KSSR curriculum with primary science education (Ng Kee Chuan, 2014). However, there are some problems that the teacher is facing in implementing the curriculum nowadays. Three main problems highlighted in this study were the teaching activities, learning activities, and the incorporation of ICT in learning.

1.4.1 Teaching activities

The flipped learning model can guide educators to teach effectively in a new way of teaching as most educators are still using the traditional way of teaching (Mohsin et al., 2021). There are some reasons teachers prefer and still teach traditionally. The first issue is about the time constraint on primary science learning sessions at the school. According to the latest policy on the primary school learning time allocation by the ministry of education, the students will have only two hours of a science lesson in a week from the initial two hours and a half period. This 30 minutes time reduction did affect the implementation of learning activities. This issue caused the learners to learn science subjects in a rush manner since the teacher needs to complete the syllabus in a rush. The reduced learning time also led to the students' limited learning experience. This issue is somehow affecting the quality of learning interaction among the students and teachers. Students and teachers need to have ample time for

discussion. Students need to have more time to ask questions while learning and promote reasoning and problem-solving skills (Gillies et al., 2013). If students have limited communication with the teacher in a limited time of learning, not many questions can be expected.

With limited time for science learning, not much can be done by the teachers. Some of them could only focus on remediating the low-achieving students but not for the enrichment activity (Smeets, 2005). As for the students, lack of time caused them to have limited exposure to the practical activities related to the manipulative skills, thus creating a problem at the secondary level (Fadzil & Saat, 2013). The primary science learners need to be given ample opportunities to do scientific investigation through hands-on activities and experiments. Many primary science teachers appear to feel less important of the in-class scientific investigation when they face time constraints and lack of learning materials (Mohamed et al., 2013). In secondary school, the learners would become incompetent in doing practical activities such as experiments. The learners would prefer to learn only from reading and not by doing the activities in class, while the teacher is in a rush to complete the syllabus.

The spoon-feeding situation is not beneficial to the learners since the learners acquire knowledge by remembering instead of practising the knowledge (Dehler & Welsh, 2014). If teachers rush to complete the syllabus, how can learners learn science more effectively? The learners need to develop their understanding of the content knowledge through various learning activities such as games, project-based learning, and other group work activities. Hence, the development of thinking skills may also be blocked (Row et al., 2016). The limited student's learning time exposure would result in low-skilled thinking in applying specific thinking strategies, habits of mind, and metacognitive thinking.

1.4.2 Learning activities

There is a teacher's belief that to make the learners master the learning. The learners need to do much practice and memorizing. This notion led to the drilling activities

such as memorizing science notes and formulas and answering many examination questions. This situation promotes passive learning among the learners. For example, students have a poor understanding of science concepts and science process skills in one study, such as making hypotheses (Faridah Binti Darus & Rohaida Mohd Saat, 2014). They were merely trained to memorize the formula of writing a hypothesis without genuinely understanding the variables in the respective experiment. Similarly, students were found to have problems imagining the moon phase process because of their lack of experience in theoretical and abstract knowledge (Kamisah Osman, 2012). The teacher can apply hands-on learning activities to promote the learner's creativity and higher thinking skills instead of memorizing information to score good marks.

Apart from that, learning engagement is also considered one of the crucial elements in a learning process. Students and teachers should be attached to mutual teaching and learning interaction. Some misunderstandings on the fundamental physics concept in level one and two primary science subjects can be caused by the weak interaction between the students and the teacher (Abdullah, 2013). Some students appeared to be less interested in teaching and learning at their school (Suduc et al., 2015). They are prone to get bored and uninterested in the one-way teacher-centered approach practiced in some schools (Zohrabi et al., 2012).

1.4.3 Incorporation of ICT in teaching and learning

Some teachers were aware of the benefits of using mobile learning in learning and facilitating, but they decided not to use it (Samad et al., 2019). The other constraint that the teachers face is a lack of teaching preparation time due to completing routine workloads, including the curricular, extra-curricular, and other school events. Based on a finding, teachers reported that they felt that the flipped classroom require more time and workloads such as preparing the pre-recorded learning video (Akçayır & Akçayır, 2018). These workloads somehow forced the teachers to focus on planning to finish the syllabus mainly. They thought that implementing technologies such as ICT in the classroom need more preparation time. Hence, they prefer the conventional way of teaching to deliver information. This issue is related to the

barriers to the planning and implementation process. For example, some educators have low confidence in utilizing ICT in their lessons due to some reasons such as workloads, time management constraints, skills to operate the ICT tools and materials at school (Sandra et al., 2013). Additionally, a finding stated that the actual condition of the internet facility in Malaysian schools is not as good as reported, thus affecting the teachers' motivation to use it for teaching purposes (Krishnamoorthy & Soh, 2021).

On the other perspectiveAlaw, some of the learning communities are still trapped in the conventional learning culture. This situation is worse as some teachers also have to deal with the burden of workloads in completing the school activities (Royo & Fun, 2008). This issue was seen more critical at the National Chinese Type Primary School (SJKC) (Hong & Ismail, 2015). This issue can negatively impact the teachers' motivation to create and use interactive tools since much time and effort are needed (Sandra et al., 2013). As such, how would the school be expecting the teacher to prepare a variety of educational tools?

If this situation keeps on happening in primary school, how can flipped classrooms be applied? It is undeniable that some teachers are literate in using the ICT and other interactive educational media, but they chose not to use it (Simin & Sani, 2015). While the question of 'why' and 'how' remain the same, it is noticeable that the ministry still keeps on supplying more new policies and facilities, such as ICT, a new version of the textbook that certainly needs to be evaluated. The program evaluation would benefit the 21st-century education implementation if every program were continually evaluated to improve its implementation, mainly in primary school.