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EXAMINING A VIRTUAL LEARNING ENVIRONMENT: UTILISATION FACTORS AND IMPACT ON POST-PRIMARY NATIONAL SCHOOL TEACHERS IN MALAYSIA

A thesis written in fulfilment of the requirements for a degree of Doctor in Philosophy (PhD)

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DECLARATION

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SUMMARY

The rapid development of information and communication technology (ICT) and the growing number of internet users worldwide have resulted in increased opportunities for greater knowledge and information accessibility. Ministries of Education must take advantage of the new technologies so that students and teachers can reap the potential benefits. In Malaysia, the Smart Schools initiative represents the country's beginning of a structured, nationwide investment on ICT in education. Since 2012 teaching and learning in all national schools in Malaysia are supplemented with a cloud-based virtual learning environment (VLE). This study was instigated by the fact that despite many programmes associated with the VLE platform, the Malaysian national audit findings and subsequent studies reported that utilisation of the VLE platform was between low to moderate levels. In addition, the number of in-depth studies regarding VLE implementation in Malaysia and its impact were limited.

Previous studies focused on the Malaysian teachers' readiness, attitudes and factors influencing the integration of the VLE platform in teaching and learning. This study focuses not only on the significant factors influencing the teachers' utilisation of the platform but also seeks to examine the extent of the VLE utilisation particularly amongst teachers in the Malaysian post-primary national school context. It also investigates the VLE's impacts on teachers' professional practice as well as the teacher-student relationship. Furthermore, this study also aims to understand how the Teacher ICT Integration model developed by Donnelly, McGarr, and O'Reilly (2011) fits into the hierarchical leadership culture such as practised in Malaysia. This research was conducted based on a multiple-site case study design involving 5 schools in the state of Selangor. A total of 37

interviews were conducted with teachers, school administrators, students and a policymaker. There were 8 classroom observations involving lessons with VLE integration. A teacher survey was also conducted in the case study schools which gathered responses from 170 respondents. The key findings revealed that, the utilisation of the VLE platform in teaching and learning by the teachers was still between low to moderate levels. The utilisation was mainly to provide supplementary teaching and learning resources to students. The teachers' utilisation was influenced by factors associated with the teachers, students and how the VLE platform was perceived to be suitable to support the education system.

Findings from this study suggest that many teachers perceived the integration of the VLE in teaching and learning, as well as their participations as digital content creators, as burdensome particularly at the beginning stage. However, once the educational resources were prepared, utilisation of the VLE platform was beneficial for the teachers and students. There was evidence in this study to suggest that VLE utilisation in teaching and learning helped to encourage more teacher-student interactions and collaborations. Based on the Teacher ICT Integration model, this study identified that most of the teachers were in the category of Inadvertent User (IU). However, this study proposes an extended version of the IU category to suit the Malaysian context. In general, this study provides an in-depth understanding regarding teachers' utilisation of the VLE platform in teaching and learning. The findings provide valuable insights for policymakers and other stakeholders to make informed decisions regarding the utilisation of a VLE platform including further discussions associated with the Teacher ICT Integration model and the utilisation of VLE in teaching and learning.

DEDICATION

In loving memory of my parents,

Haji Tukimin bin Haji Kiman and Hajah Alpiah binti Haji Abdul Karim,

whom I believe are smiling proudly from heaven.

A special dedication to my whole family, myself and to #you.

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CHAPTER 1: RESEARCH BACKGROUND

1.0 INTRODUCTION

The rapid development of information and communication technology (ICT) together with on-going increment in the number of internet users worldwide have resulted in increased opportunities for greater knowledge and information accessibility (UNESCO Bangkok, 2015; Wallet & Valdez, 2014). As highlighted by Miao (2015:13), "ICT can integrate learning and working, and develop skills needed to work in an information-rich environment". Many activities nowadays involve digitalisation and the internet, such as communication, banking, purchasing as well as teaching and learning. The internet has become essential for many people particularly the younger generation, as it was reported that the percentage of younger adults (16 to 24 years old) going online on daily basis has shown significant increment from 2008 to 2017 (Schleicher, 2019:5). Thus, education must take advantage of the new technologies so that students can reap the potential advantages, and at the same time preparing them for the challenges in the virtual world, such as cyberbullying, loss of privacy and illegal trade (Schleicher, 2019).

Pedagogical approach that incorporate either digital game-based or multimedia resources have gained popularity among teachers and practitioners, not only because of its potential ability to increase students' attention, engagement and motivation but also the approach is believed to promote the development of 21st century skills (Khenissi et al., 2016). In addition, UNESCO also recognises ICT as the catalyst to help achieve its Education For All (EFA) goals because it can expand access that leads to the "increase of knowledge and information" as well

as “further raising the quality of education” (Hwang, Yang, & Kim, 2010:17). ICT enables greater knowledge and information accessibility for instance via mobile technology or virtual learning environments (VLE) that allow learning to take place at anytime and anywhere (Chargois, 2014; Journell, 2010; Miao, 2015; Ministry of Education Malaysia, 2013).

1.1 BACKGROUND TO THE RESEARCH

Malaysia has always acknowledged the importance of technology in helping the country to pursue its target of becoming a developed nation (Hamid, Peng, Shaharom, Ter, & Raman, 2018). Malaysia is a developing country located in Southeast Asia, consisting of thirteen states and three federal territories. Geographically, the country comprises of Peninsular Malaysia and East Malaysia (Malaysian Borneo). It has a total landmass of 330,803 square kilometres, with a multiracial population of approximately 32.6 million as of September 2019 (Department of Statistics Malaysia, 2019). The Malay, Chinese and Indian races are the three ethnicities forming the main population in the country. In relation to education, as of 31st January 2019, there were 10, 208 government-funded schools in Malaysia. A total of 7,772 were primary schools and the remaining 2,436 were secondary or post-primary schools (Ministry of Education Malaysia, 2019). Government-funded schools in Malaysia are officially known as national schools. Meanwhile, student enrolment in the national schools was recorded at 205,199 for preschool, 2,727,068 for primary and 2,007,692 for post-primary school, bringing the overall total to 4,939,959 students as of 31st January 2019 (Ministry of Education Malaysia, 2019).

This study aims to gain an in-depth understanding of teachers' utilisation of a virtual learning environment (VLE) platform in post-primary national schools in Malaysia. Therefore, to understand the educational setting in Malaysia, this chapter begins with an explanation of the history and development of formal education in the country. Next, several sections elaborate on education at post-primary level and focus on Malaysia's involvement in promoting the growth of ICT in education in the country over the last 22 years.

1.1.1 Schools and Education Prior To Independence

Education in the early years in Malaysia dated back from the Malacca Sultanate beginning from the year 1400. It was however focusing more on religious classes managed by devout individuals and missionaries (Educational Planning and Research Division, 2008). As a country that had experienced colonialisations from the Portuguese, Dutch, Japanese and British, education in Malaysia or Malaya as it was known prior to 1963, continued to unfold and began to intensify especially after the Chinese from mainland China and the Indians from India were brought in to the country to work at tin mines and rubber plantations (Educational Planning and Research Division, 2008). The influx of Chinese and Indian immigrants resulted in the establishments of Chinese-based and Tamil-based (Indian) education in Malaya. Today, national Chinese-based and Tamil-based schools formally categorised as vernacular schools are among the available options for parents to send their children for education at primary level. However, once the students from these vernacular schools have completed their primary education, they can proceed to either receiving education at one of the various types of post-primary national schools or attend privately held Chinese-based

post-primary schools. At present, there is no Tamil-based post-primary school in Malaysia.

While the Portuguese and Dutch occupancy in Malaya had either limited or no impact on education, the 130 years of British reign on the other hand played a significant influence for instance with the establishment of three English schools namely the Penang Free School (1816), Victoria Institution (1893) and St. John's Institution (1893). The three schools are still in existence to the present day. Although the English schools were initially introduced to prepare students for the Cambridge Overseas School Certificate as well as to spread Christianity among the locals, educational restructuring over the years have resulted in these schools being categorised as regular post-primary national schools (Educational Planning and Research Division, 2008). The educational restructuring stemmed from the local people's dissatisfaction with the policy of 'divide and rule' implemented during the British occupancy (Tan, 2013:337).

According to Phillipson (1993) as cited by Tan (2013), the divide and rule policy meant that the elites and aristocrats received exclusive education with English as the medium of communication but the general public used vernacular languages for their education. Hence, as a step to bridge this education gap, the previously exclusive Selangor Raja School was relocated, reopened and rebranded as the fully residential (boarding) Malay College Kuala Kangsar (MCKK) in 1905. Most importantly, the MCKK accepted enrolment of Malay students from both the aristocrats as well as the non-elites (Educational Planning and Research Division, 2008; Y. S. Tan, 2013b).

1.1.2 Schools and Education Post-Independence

Malaysia gained independence from the British colonialisation on 31st August 1957. As a multiracial country, there was awareness amongst the locals of the importance of having a common education system that would unite the different races and maintain racial harmony (Y. S. Tan, 2013a; Department of Information, 2015). Thus, apart from concentrating on nation-building and skill-improvement for the students, educational policy reviews that were implemented post-independence until the proclamation of the 1979 Cabinet Report also focused on "consolidating the diverse school systems into a cohesive national education system" (Educational Planning and Research Division, 2008:10). As a result, Malay Language became the main medium of instruction because of its status as the national language for Malaysia. Similarly, the school curricula and subject syllabi were designed to support the national agenda of uniting the various ethnic groups (Educational Planning and Research Division, 2008).

Educational development in Malaysia has also been greatly influenced by changes to the country's socioeconomic plan. Kraak (2013) highlighted that Malaysia is an example of a country that has experienced rapid economic growth by focusing on the development of human capability, which proves to be critical to economic success. Malaysia introduced a socioeconomic restructuring programme called the New Economic Policy (NEP), which took effect from 1971 to 1990 (E. C. Tan, 2014). The NEP was designed with the main objectives of aiming to eradicate poverty irrespective of race and the restructuring of society to eliminate the identification of race according to economic functions and geographical locations (Abdul Aziz, 2012; Educational Planning and Research Division, 2008; E. C. Tan, 2014). As a strategy to achieve the objectives of the

NEP, the government via the Ministry of Education (MoE) started to build more schools in rural areas to provide better access for rural children (Educational Planning and Research Division, 2008). In addition, the Malay Language has been maintained as the official medium of instruction, while students in national schools follow the same curriculum and sit for the same public examinations (Educational Planning and Research Division, 2008).

1.1.3 The Different Types of Schools for Nation-Building

Another significant change in the national education system with the implementation of the NEP was the introduction of science and technical subjects in the national schools. These subject fields were introduced in an effort to produce "skilled workforce in the areas of science and technology" (Educational Planning and Research Division, 2008:14). Although in general all post-primary national schools offer science and technology subjects, classes offering natural science subjects such as Biology, Chemistry and Physics are most commonly available in the fully residential schools (Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, 2013). As of 2016, the MCKK alongside 68 other fully residential schools in Malaysia continue to host post-primary education for the country's best students. The post-primary boarding schools are highly regarded in Malaysia not only because of the more competitive enrolment process, but also due to the schools' ability to provide students with a better educational programme, infrastructure and more conducive learning environment (Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, 2013). Meanwhile, although ICT is not one of the core subjects in Malaysian national schools, students have been exposed to technology-enhanced lessons especially since

the implementation of the Smart School initiative, which will be described further in 1.2.1.

As highlighted earlier, the implementation of the NEP has also initiated the teaching of technical and vocational subjects in national schools, catering for students at Upper Secondary level (16 years old and above). Among the technical and vocational subjects taught in the technical schools and vocational colleges are automotive engineering, carpentry, catering and food preparation, tailoring and fashion design, multimedia production and computer graphics (Bahagian Pendidikan dan Latihan Teknikal Vokasional, n.d.; Educational Planning and Research Division, 2008). In line with the aspiration to produce a skilled workforce for the country, the technical and vocational education emphasise on hands-on and practical activities for the students (Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, 2013; Educational Planning and Research Division, 2008).

The Malaysian National Philosophy of Education emphasises the holistic development of each student. It is “an on-going effort towards further developing the potential of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally and physically balanced and harmonious…” (Ministry of Education Malaysia, 2013:E4). Consequently, the first national sports school was opened in 1996 not only to academically train young Malaysian athletes who are still at post-primary level, but in particular to groom them to be able to compete in various sports at international events. Apart from that, there are also national arts schools to develop talented students in the fields of music, performing arts and visual arts (Bahagian Perancangan dan

Penyelidikan Dasar Pendidikan, 2013; Educational Planning and Research Division, 2008). As of 2019, the national schools in Malaysia comprised of 69 fully residential schools, 281 religious (Islamic) schools, 85 vocational colleges, 9 technical schools, 5 sports schools, 3 arts schools and 9,756 regular national schools (Ministry of Education Malaysia, n.d.).

1.1.4 School Branding and Recognitions

Although all post-primary national schools in Malaysia implement a common basic curriculum outlined by the Ministry of Education, the distinctions between the different types of schools are portrayed through several other criteria. For instance, as described earlier, students accepted into fully residential schools are high achievers in both academic as well as co-curricular activities. Islamic studies are emphasised in the religious schools, while hands-on and practical Science, Technology, Engineering and Mathematics (STEM) curricular as well as Technical and Vocational Education and Training (TVET) syllabi are highlighted in technical and vocational schools.

The MoE acknowledges the importance of providing quality education for all students, regardless of the type of school they are enrolled in. As Malaysia adopts a centralised education system, the MoE had issued a school-based assessment guideline named the *Standard Kualiti Pendidikan Malaysia (SKPM)* or literally translated as the Malaysia Education Quality Standards, for implementation in all national schools (Jemaah Nazir dan Jaminan Kualiti, 2010). From 2018, all schools began to use the revised version of the standards, known as the

Standard Kualiti Pendidikan Malaysia Gelombang 2 (SKPMg2) (Jemaah Nazir dan Jaminan Kualiti, 2017).

Klaf (2013) mentioned that labelling of school performance is a technique of governance that leads to the public's perception regarding the standard of education in a country. In Malaysia, some schools have been recognised and labelled as cluster schools, centenary schools, premier schools, smart schools, high-performance schools and school of global excellence. Ruslan, Othman and Sheikh Ahmad (2009:2) indicated that the aim of such recognitions is to "transform and propel the standard of education towards world-class". Based on information from the Department of Information Malaysia (2016), some examples of the recognitions given to existing national schools and the years in which the recognitions have been introduced by the MoE are Smart Schools (1997), Vision schools (2004), Premier (centenary) schools (2006), Cluster schools (2007), High-performance schools (2010) and School of Global Excellence (2014).

1.2 THE DEVELOPMENT OF ICT IN EDUCATION IN MALAYSIA

In line with the vast development of ICT towards the end of the 20th century, Tun Dr. Mahathir bin Mohamad, Malaysia's Prime Minister (1981-2003) and (2018-2020) described the importance for Malaysians to be ICT literate and adept at utilising technological capabilities, as part of the critical enabler for the country to achieve the status of a developed country, which is the ultimate objective of Malaysia's Vision 2020. Vision 2020 represents Malaysia's shift to the knowledge economy, from focusing on resource-based industries, after what was originally an agriculture-based nation. The following excerpt is from Tun Dr. Mahathir bin

Mohamad's speech while launching the Vision 2020 agenda at a Malaysian Business Council meeting on 28 February 1991.

> "In a world of high technology Malaysia cannot afford to lag behind. We cannot be in the front line of modern technology but we must try to catch up at least in those fields where we may have certain advantages…The Government will certainly provide the necessary commitment and leadership to this national endeavour. The institutional and support infrastructure will be put in place to ensure rapid, realistic, focused and market-driven development of our technological capabilities…In the information age that we are living in, the Malaysian society must be information-rich…increasingly, knowledge will not only be the basis of power but also prosperity… Malaysians are among the biggest users of computers in the region. Computer literacy is a must if we want to progress and develop."
>
> (Mohamad, 1991).

The most significant tangible evidence of Malaysia's commitment to knowledge economy is the establishment of MSC Malaysia or previously known as the Multimedia Super Corridor project (Shapira, Youtie, Yogeesvaran, & Jaafar, 2006; Yigitcanlar & Sarimin, 2015). MSC Malaysia is an example of a knowledge-based urban development project that modelled the success of other high-technology research centres and parks such as the Silicon Valley in the USA (Yigitcanlar & Sarimin, 2015). The outlines of MSC Malaysia have been translated into series of development plans, guided by seven flagship applications including the Smart Schools initiative (Nordin, 2001).

1.2.1 The Malaysian Smart Schools (1999 - 2020)

The Malaysian Smart Schools initiative represents the country's beginning of a structured, nationwide investment on ICT in education. The initiative is set out via four major stages of developments and basically aims at creating "a new

generation of Malaysians who are creative and innovative in their thinking, adept with new technologies, and able to manage the information explosion in order to transform to a knowledge-based economy" (MSC Malaysia, 2015:1). The first stage of development known as Wave 1 – The Pilot Phase (1999-2002) involved the selection of 88 schools nationwide to implement the Smart Schools concept. The Smart Schools concept emphasises technology-enhanced teaching and learning to support lessons and activities that stimulate the students' thinking, foster creativity, encourage flexibility, collaborative learning and more active student-participations (Chan, 2002; Zain, Atan, & Idrus, 2004).

In Wave 2 – The Post-pilot (2003-2005), the MoE reviewed the lessons learnt from Wave 1. Consequently, initiatives such as digital coursewares, e-materials, computer laboratories and internet connectivity (SchoolNet) were expanded to more schools in the country. Wave 3 – Making All Schools Smart (2006-2010) focused on leveraging the Smart Schools concept to all primary and post-primary national schools in Malaysia. The 88 Smart Schools served as the nucleus of the ICT in education initiative, championing and guiding the surrounding schools to instil the culture of integrating ICT in education. Finally, Wave 4 – Consolidate and Stabilise (2011-2020) focuses on the culture of incorporating innovative practices using ICT in education.

The Smart Schools initiative has attracted policymakers, practitioners, academia and industry players to conduct studies on its strengths and weaknesses. Findings from studies between 2003 and 2009 (Wave 2 - Post-pilot and Wave 3 - Making All Schools Smart) conducted by the MoE and Malaysia Digital Economy Corporation (MDEC), the agency that oversees the implementation of

MSC Malaysia, emphasised the “critical need to conduct an architecture review of the smart schools initiative to align it with changes coming from the dynamics of internal needs and external environment” (Ministry of Education, 2010:4). Meanwhile, previous studies indicated that most teachers in Malaysia have positive attitudes towards ICT and are willing to use it for the purpose of teaching and learning (Cheok, Wong, Ayub, & Mahmud, 2013; Frost & Sullivan, 2006; Jalil, Umar, & Jalil, 2012; Yin, 2013). However, the same studies also revealed that the willingness to use ICT did not necessarily translate to actual integration of technology during lessons. Previous studies by Cheok, Wong, Ayub and Mahmud (2013), Frost and Sullivan (2006), Jalil, Umar and Jalil (2012) and Yin (2013) revealed that teachers often cited problems related to first-order barriers which will be described further in Chapter 2.

Consequently, in an effort to encourage active interest and participation from schools, as well as in response to past studies that indicated underutilisation of the ICT infrastructure, the MoE in collaboration with MDEC developed a monitoring tool called the Smart School Qualification Standards (SSQS) to measure and grade ICT utilisation based on Star Ranking (MSC Malaysia, 2009). The Star Ranking exercise is conducted in all national schools once in a year, in which identified ICT Focus Areas comprising of utilisation (40%), human capital (40%), applications (10%) and technology infrastructure (10%) are measured and ranked between 1 to 5 stars. Schools must achieve a minimum of 3-stars to qualify as a Smart School.

Therefore, schools that recorded less than 3-stars require urgent steps to regain their position on the right development track (MSC Malaysia, 2009). The SSQS

instruments are constantly revised based on the current ICT initiatives implemented by the MoE (BTPN Melaka, 2015). In addition to that, the study on Architecture Review of the Smart School initiative conducted in May 2010 highlighted the need for ICT in Education policy "to guide the full realisation of benefits and potential in education using ICT as a critical enabler" (Ministry of Education, 2010:4).

1.2.2 ICT in Education Beyond the Malaysian Smart Schools Initiative

Malaysia realises that the international environment is becoming increasingly competitive. Therefore, the government via its Performance Management and Delivery Unit (PEMANDU) acknowledges that education standards need to be improved in order to ensure the young and future Malaysians are best equipped to compete for employment and opportunities on the international stage (PEMANDU, 2010). In response to this, the MoE initiated a comprehensive review of the education system, gathering inputs between October 2011 to December 2012 from various sources including MoE reports, previous studies, as well as views from parents and the community (Ministry of Education Malaysia, 2013). As a result, the Malaysia Education Blueprint (MEB) 2013-2025 was launched in September 2013. The MEB 2013-2025 emanates from a combination of predominant government policy such as the Government Transformation Programme (GTP) and Vision 2020. It was also derived from stakeholders' concern regarding the quality of education in Malaysia (Ministry of Education Malaysia, 2013).

As ICT continues to play a significant role among the digital natives of the 21st century and becomes a critical enabler in contemporary teaching and learning, it

is apparent that the Malaysian policymakers and stakeholders perceive ICT as an important agenda for the transformation of education system in the country. The MEB 2013-2025 outlines eleven shifts that will help to deliver the educational outcomes envisioned by all Malaysians. Shift seven (7) in particular emphasises on the need to "leverage ICT to scale up quality learning across Malaysia" (Ministry of Education Malaysia, 2013:E20). This is in-line with UNESCO's stance which emphasises that ICT "must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision" (UNESCO, 2016:8). UNESCO has further suggested the use of ICT, particularly mobile technology, to help accelerate progress regarding literacy and numeracy programmes. Apart from that, ICT is also crucial in providing distance education as well as facilitating "a learning environment at home, in conflict zones and remote areas" (UNESCO, 2016:46). Hence, since there is a huge number of national schools in Malaysia, comprising of various locations across the nation, the MoE aspires to provide equitable access to quality teaching and learning resources at anywhere and anytime through the implementation of the ICT in education initiatives (Ministry of Education Malaysia, 2013).

1.2.3 Virtual Learning Environment (VLE) in Malaysian National Schools

In the Malaysian context, the proposal to implement a VLE on a nationwide scale was initiated as part of the government's Economic Transformation Programme (ETP). The ETP was launched in September 2010 to help elevate the country to the targeted developed-nation status as formulated in Vision 2020. The ETP introduced National Key Economic Area (NKEA) that included targets specified

for the Communications Content and Infrastructure (CCI) sector. The targets for the CCI NKEA were formulated to achieve “continued growth in communication services and enabling the paradigm shift from infrastructure and access to applications and content” (PEMANDU, 2012:152). An area of emphasis within the CCI NKEA involved an Entry Point Project (EPP) targeting to establish VLE platforms for students and professional trainings.

The government’s Performance Management and Delivery Unit, acronymed as PEMANDU (2012) emphasises that the implementation of a VLE in Malaysia is based on a collaboration between the public and private sector. In this case, the private sector’s contribution is via ensuring the deployment of fibre infrastructure for broadband connectivity around the country. Apart from that, the private sector is also involved in providing affordable ICT devices to be used by the students and teachers (PEMANDU, 2012). In relation to providing the broadband connectivity to serve the population in primary and post-primary national schools, the MoE in partnership with a local private organisation initiated the 1BestariNet project in December 2011, which was an improved version of the previous SchoolNet project. 1BestariNet equipped the national schools with internet access, as well as an integrated learning solution named Frog VLE, that enabled teaching, learning, communication and administrative functions to take place through a cloud-based platform (FrogAsia, 2016). YTL Communications Sdn. Bhd. (YTLC) was officially awarded the contract for the first phase of 1BestariNet from May 2012 (National Audit Department Malaysia, 2013). The contract with YTLC was renewed for the second phase of 1BestariNet beginning from July 2016 until June 2019 (Jabatan Audit Negara, 2019). With the end of 1BestariNet Phase 2, the MoE announced that three telecommunication providers in the

country (Telekom Malaysia Berhad, Celcom Axiata Berhad and Maxis Broadband Sdn. Bhd.) were appointed to provide internet connectivity to schools for an interim period from 1st July to 31st December 2019. At the same time, Google Classroom has replaced Frog VLE during the interim period (Corporate Communication Unit, 2019).

Since the main data collection for this study was conducted in 2018, reference to the internet connectivity and VLE platform was based on 1BestariNet and Frog VLE. Frog VLE is one of the learning platforms which has been designed and developed by Frog Education in the United Kingdom (FrogAsia, 2016; Hew & Syed Abdul Kadir, 2016). Frog VLE in Malaysia is managed by a private company named FrogAsia Sdn. Bhd (FrogAsia). Through 1BestariNet and Frog VLE, Frog Asia aimed to help achieve the ICT-related objectives stated in the MEB 2013-2025. The objectives in the MEB 2013-2025 include capitalising on the appropriate technology to provide equal access to quality education, upscaling quality learning across Malaysia and connecting with the education community, parents as well as private partners to transform education in Malaysia (FrogAsia, 2016; Ministry of Education Malaysia, 2013). During the implementation of Frog VLE, the MoE set two Key Performance Indicators (KPIs) as an operational strategy towards achieving the technology-related objectives of the MEB 2013-2025. The KPIs focused on the average number of students utilising the VLE platform and the number of learning sites shared by teachers to the VLE platform's Frog Store (Bahagian Teknologi Pendidikan, 2018).

In the Malaysian context, Frog VLE partly served as a communication platform amongst the school community, as well as with the parents. As a communication

platform, Frog VLE enabled the dissemination of information for instance regarding school activities, announcements, regulations and academic circulars amongst school community and the parents. Teachers were also able to assign homework or assignments to the students and submission of tasks was feasible via Frog VLE (FrogAsia, 2016). Nevertheless, Frog VLE for the Malaysian primary and post-primary national schools mainly served as a repository for teaching and learning resources. Teachers, students, school administrators and parents were given individual 1BestariNet identification (ID) for them to access teaching and learning resources from the FrogStore. The FrogStore is a digital 'marketplace' within Frog VLE where the teachers, school administrators, students and parents could either add an item to their personalised 'My Library' or purchase e-books, media (images, video and audio files) and revision materials (FrogAsia, 2016).

Apart from the available educational resources from the FrogStore, teachers were also encouraged by the MoE to develop their own interactive lessons or learning sites that could be used and shared with students and other teachers (Bahagian Teknologi Pendidikan, 2015). It was reported that building a learning site had been made much easier because firstly, the teachers were able to choose from a selection of VLE widgets with functions such as media attachments, file uploading and downloading, student discussions, links to other learning sites within Frog VLE, as well as updates from MoE Malaysia's Rich Site Summary (RSS) feed (FrogAsia, 2016). Secondly, teachers were able to drag and drop actions in Frog VLE during the process of building the learning sites. Furthermore, apart from the availability of online tutorials within Frog VLE, the MoE and FrogAsia had organised professional development sessions for

teachers, guiding them with the steps to develop the learning sites (Bahagian Teknologi Pendidikan, 2015; FrogAsia, 2016).

VLE implementation in developed countries such as the USA has traversed into virtual schooling or distance education. In Malaysia, the concept of distance education is only available at university level. Since VLE in the Malaysian primary and post-primary national schools had only begun in 2012, current efforts still focus on increasing the utilisation of the VLE platform to enhance students' educational experience via a blended learning approach (FrogAsia, 2016; Hamzah & Yeop, 2016; Hassan & Mohsin, 2015; Ministry of Education Malaysia, 2013; Nithia, Yusop, & Razak, 2015). Fleck (2012:398) defines blended learning as a mix of conventional face-to-face teaching combined with "online-supported activity". According to Fleck (2012), there are different approaches to blended learning categorised by the extent of the online versus face-to-face activities. For instance, an academic institution uses a VLE platform to provide additional notes and materials to support conventional teaching and learning. On the other hand, interactive online activities "may be supplemented by episodic face-to-face" teaching and learning approach (Fleck, 2012:399). Regardless of whichever approach is adopted, Fleck (2012:404) highlighted that the role of technology "lies in the minutiae of how the technology is used". Further elaborations regarding the role of ICT in education, including discourse on blended learning approach will be discussed in Chapter 2.

1.3 RESEARCH PROBLEM

Since 2012, the MoE had provided all national schools in the country with access to Frog VLE. At the end of 2014, it was reported that more than 8,000 national schools in Malaysia were connected to the internet with a speed of between 2Mbps to 10Mbps (PEMANDU, 2015). Apart from the ICT infrastructure, the ETP Annual Report 2014 also highlighted that at that time, there were more than 11,500 lesson or learning sites available on Frog VLE (PEMANDU, 2015). With regard to monetary expenditure, the Malaysian Economic Council had approved an estimated provision of around RM4.5 billion or approximately EUR900 million for an overall period of 15 years for the implementation of the internet connectivity cum VLE project (National Audit Department Malaysia, 2013). The Malaysian Ministry of Finance reported that for the first 2 years and 6 months since the implementation of 1BestariNet and Frog VLE initiatives, the project tender was worth RM663 million or approximately EUR133 million (National Audit Department Malaysia, 2013). With substantial amount of monetary and resources invested to transform teaching and learning in Malaysia, stakeholders placed high expectations that Frog VLE would be utilised and able to provide the return-on-investment for the government.

However, the Malaysian government's national audit findings reported that at the end of 2013, usage of Frog VLE was only at 5% of the actual capacity (National Audit Department Malaysia, 2013). Several follow-up studies were conducted both by the MoE and academia mainly to identify reasons for the underutilisation as well as the Malaysian teachers' readiness in using Frog VLE. For example, a case study on Malaysian teachers' readiness to utilise the VLE indicated that the majority of teachers in the participating schools were still unprepared and

possessed inadequate skills to utilise the platform, despite having attended specific training sessions (Termit & Noorma, 2015). Similarly, in a study conducted by Md. Keling, Madar and Abd. Salam (2013:103), it was reported that teachers in Malaysia only engage with Frog VLE less than 10 times per month, or “when needed”, thus resulting in what the research defined as a moderate level of usage. This phenomenon existed despite findings from the same study indicated that the teachers were ready and had high interests in using VLE for their teaching and learning purposes. The studies conducted by Md. Keling et al. (2013), Termit and Noorma (2015) and Hamzah and Yeop (2016) identified some common reasons leading to the moderate level of VLE utilisation. Among the reasons were attributed to the difficulty in gaining access to Frog VLE, less user-friendly nature of Frog VLE interface and widgets as well as slow internet connectivity via 1BestariNet, which often led to a serious time lag.

Meanwhile, Soon (2014) highlighted that a study conducted by the Educational Technology Division of the MoE recorded varying degrees of the VLE usage amongst teachers and students. Around 65.2% of teachers who took part in the survey indicated that they used Frog VLE for teaching and learning but only 47.5% of them used the platform to send homework to students. Furthermore, 68.6% of teachers indicated that they did not use the VLE platform to check students’ assignments while 67.1% of students did not send assignments via the platform. It is therefore evident that although the MoE and YTLC had been dedicating efforts and resources to implement Frog VLE, the school community did not optimally utilise the platform as a means to enhance teaching and learning. Soon, (2014) stresses that in order to successfully implement high

impact ICT in education projects such as the 1BestariNet and Frog VLE initiatives, it is very important that there is “buy-in” from all stakeholders.

In 2018, another phase of audit that included the 1BestariNet and Frog VLE initiatives was conducted by the National Audit Department of Malaysia. Findings from the 2018 audit revealed that whilst in general schools had access to the internet and the VLE platform, utilisation of Frog VLE was still low and confined to usage in computer laboratories as well as during official school hours (Jabatan Audit Negara, 2019). The department (Jabatan Audit Negara, 2019:50) highlighted several areas of concern including the following results:

(a) A total of 3,698 (36.3%) from the 10,185 schools had never reached the KPI associated with utilisation of Frog VLE in 2018;

(b) In 2018, the percentage of teachers involved in learning site development which had been published in FrogStore was low, in particular only 3,317 (0.8%) from the total of 423,556 teachers nationwide.

Hence, the 2018 audit findings suggested that after approximately 6 years of implementation, utilisation of Frog VLE by the teachers and students in national schools in Malaysia was still stagnant. Based on previous studies and audit reports highlighted in this section, utilisation of Frog VLE was at low to moderate levels. In other words, the MoE was still unable to get the ‘buy-in’ from the stakeholders in order to promote an optimum utilisation of the VLE platform, subsequently obtaining the return-on-investment for the government.

1.4 RESEARCH QUESTIONS

Taking into consideration the audit findings as well as previous studies that mainly focused on teachers' readiness to use the VLE platform, this study aims to gain an in-depth understanding regarding teachers' utilisation of the VLE in post-primary national schools in Malaysia. The study aspires to examine the extent and nature of the teachers' utilisation of the VLE platform by focusing on the following research questions:

(i) What are the significant factors influencing the teachers' utilisation of a VLE platform?

(ii) How does the utilisation of the VLE platform affect the teachers' professional practice?

(iii) How does the integration of the VLE platform in teaching and learning affect the teacher-student relationship?

(iv) How do the teachers relate to the ICT Integration model and what are the implications for the utilisation of the VLE in post-primary national schools in Malaysia?

1.5 SCOPE OF STUDY

This study entailed an investigation of the implementation and utilisation of the VLE platform specifically in post-primary national schools in Malaysia. Furthermore, this study focused mainly on the integration of the VLE platform to support teaching and learning. Therefore, results from this study did not give a comprehensive view of the whole potential of the VLE platform. Instead, the results mainly reflected responses from teachers, students and school

administrators within the context of implementation and utilisation of the VLE platform for teaching and learning in Malaysian post-primary national schools.

Apart from that, although the VLE initiative is a nationwide programme, due to the massive total number of post-primary national schools in Malaysia, this study was conducted using the multiple case study method. Therefore, a limited number of case study schools were included as a sample from the general population. In addition, only one particular state in Malaysia was involved in this study. The state fulfilled the following criteria set for this study:

(v) One of the states with a high number of post-primary national schools;

(vi) One of the states with a consistently high number of post-primary national schools that appeared in the list of 'top 20 most active usage of VLE' (MoE data as of January to March 2016).

(vii) The state with different types of post-primary national schools including schools that received recognitions by the MoE (data as of April 2016).

1.6 SIGNIFICANCE OF THE RESEARCH

This study is significant because it provides a practical framework for the implementation of the VLE platform especially at post-primary school level. Findings from this study potentially contribute to an understanding of the significant factors that influence teachers to utilise a VLE platform, simultaneously giving some references for other teachers, school administrators and policymakers to consider when planning to either begin or improve the implementation of VLE integration for teaching and learning. Findings from this study can also be used to stimulate more discussions regarding the impact of VLE utilisation on teachers' professional practice. Apart from that, this study has

also yielded some insights on the impact of VLE integration on the teacher-student relationship, providing further testimony to the current literature regarding the topic.

In the Malaysian context, since the previous national audit reports indicated an underutilisation of the VLE initiative, findings from this study provide a useful basis for recommendations to improve VLE utilisation. In addition, this study also provides a sample of evidence regarding the teachers' beliefs with regard to the integration of the VLE platform in teaching and learning. Since the implementation of the VLE platform is an on-going long-term nationwide initiative by MoE Malaysia, evidence presented in this study are useful for the MoE in making informed decisions, or taking the necessary measures to improve the existing strategic plans and practice, so as to reap the benefits from the huge investment on the VLE initiative, as well as achieving the educational aspirations highlighted via the MEB 2013-2025.

1.7 SUMMARY

This chapter has outlined the background to the research, starting with an introduction to Malaysia and its education system. The chapter also included a detailed elaboration focusing on Malaysia's involvement in promoting ICT in education. This chapter also explained the research problem that led to the formulation of the research questions guiding this study.

CHAPTER 2: LITERATURE REVIEW

2.0 INTRODUCTION

The information and communication technology (ICT) has brought enormous changes in different aspects of human lives. The United Nations, via its International Telecommunication Union (ITU) suggests that ICT in the modern world helps to improve governance, services, supply chains and communication (ITU Telecommunication Development Bureau, 2016). In particular, from the economic and work perspectives, ICT has been associated with better productivity, cost-effectiveness and efficiency. ICT has also been an invaluable tool to allow faster and easier communication between colleagues, friends and family. In education, ICT offers the potential for a revolution in pedagogical approach and learning experiences as well as access to a variety of educational resources (Kozma, 2011).

Since the late 20th century, and in particular the mid-1990s, many governments around the world have been paving the way for investments in digital technology while educational policymakers have constructed strategic plans and policies on ICT in education (Chua, 2012; Johnston, 2014; Jones & Cowie, 2011; Ministry of Education, 1997; Yeung, Taylor, Hui, Lam-Chiang, & Low, 2012). For instance, the USA launched the National Education Technology Plan and the Technology Literacy Challenge, the UK implemented the National Grid for Learning, New Zealand introduced the ICT Strategic Framework for Education, the Republic of Ireland began with Schools IT2000 and Singapore commenced with the Masterplan for ICT in Education (Chua, 2012; Johnston, 2014; Yeung et al., 2012). Just as digital technology progresses rapidly, the ICT strategic plans and policies also evolve accordingly. Previously, the central idea used to be about

introducing computers and multimedia applications as accepted tools for teaching and learning. However later, policymakers and educational stakeholders began establishing more emphasis on promoting the internet and mobile devices that allow students to gain knowledge and skills in a self-directed, self-paced learning via a virtual environment (Chua, 2012; Sa'don, Dahlan, & Ibrahim, 2013; Soon, 2014). More recently, governments, industries and academia have focused on the fourth industrial revolution (IR4.0) which capitalises on "digital technology, automation and artificial intelligences" (Majid, 2019:247).

However, there are some criticisms that highlight misalignments between ICT in education policies and the actual development of digital technology. For example, it is argued that in an effort to be up-to-date, ICT in education policies often add new technology before the teachers can pedagogically master the previous application. As a result, the impacts of the provision of technology and investments on ICT in education initiatives have been "less than had been anticipated" (Jones & Cowie, 2011:4). Consequently, policymakers in some countries have exercised greater caution in their subsequent policy-related decisions due to various factors such as availability of financial resources, roles and influence of different stakeholders during policy negotiations, rapid development of digital technology and the complexity of ICT integration in teaching and learning (Johnston, 2014; Jones & Cowie, 2011; Prensky, 2012).

ICT in education should not be about a race between technology and education, nor should it be about catching up with what is the latest trend. Instead, the focus should always center on the role of ICT as an enabler for teaching and learning (Bhaumik, 2013; Teoh, 2015; Tondeur, Forkosh-Baruch, Prestridge, Albion, &

Edirisinghe, 2016). Students and teachers are the two stakeholders who are mostly affected by the decisions on educational policies and transformations. Whilst students are the final beneficiaries of every educational initiatives, teachers play a crucial role in interpreting the policies and implementing the initiatives in teaching and learning (Jones & Cowie, 2011; Ministry of Education Malaysia, 2013; Parsons & Adhikari, 2016; Scott, 2015; Won, 2010).

Therefore, in an effort to understand why there are continuous investments, strategic plans and educational technology-related policy, this literature review will firstly address the impact of ICT in education on the students as well as the teachers. Since the main focus of this study is on a specific type of ICT in education involving a virtual learning environment (VLE), examples cited in this literature review will include both the general impact of ICT as well as findings related to VLE. The second section will discuss factors influencing teachers' integration of ICT in education, since as indicated earlier, they translate educational policy into actions. This section will probe the relationship between teachers' beliefs, continuing professional development (CPD) and integration of ICT in education, as well as identifying barriers and relevant frameworks to describe teachers' ICT integration. The next section will analyse the role of teachers in mediating technology integration, exploring the transformation between the 20th century teaching and learning styles to the current expectations in the 21st century. Discussions will include implications of technology integration towards the teacher-student relationship, potential methods in which the VLEs have been used for teaching and learning, as well as inputs regarding the teachers' role and contribution as digital content developers.

2.1 IMPACT OF ICT IN EDUCATION

The investments and policies on ICT in education are translated into digital technology programmes for implementation in schools. The execution of ICT in education programmes or initiatives especially those which involve monetary investments, often leads to assessments or scrutiny, such as in the form of a compliance audit or programme evaluation (Posavac, 2011). According to Boulmetis and Dutwin (2011) and Posavac (2011), a compliance audit clearly examines whether an initiative is being implemented according to the documented procedures, while a research may question theoretical interests, test some hypotheses or explore specific areas of the project.

Meanwhile, a programme evaluation involves a systematic process of data collection and analysis to determine the effectiveness and value of the particular initiative, as well as identifying strengths and weaknesses so that corrective actions or improvement measures can be taken to achieve better quality and outcomes (Boulmetis & Dutwin, 2011; Posavac, 2011; Soon, 2014). Therefore, any type of assessment or scrutiny is crucial because the information and feedback garnered via the process are indicative of the next step that should be taken with regard to the programme or initiative. In other words, it is important to conduct assessments or evaluations of the ICT in education programmes in order to provide justifications not only with regard to the implementations, but also to determine the return-on-investments.

Public and private organisations, academia and concerned individuals have conducted various studies and evaluations ever since technology became part of teaching and learning. The studies and evaluations include a variety of foci such

as from addressing the development and implementation of ICT in education policy, to the more operational perspectives related to teachers' and students' readiness and attitudes to ICT integration, as well as on the impact of technology on education (Avvisati, Hennessy, Kozma, & Vincent-Lancrin, 2013; Bai, Mo, Zhang, Boswell, & Rozelle, 2016; Cameron, 2015a; Chandra & Briskey, 2012; Hegedus, Dalton, & Tapper, 2015; Johnston, 2014; Junus, 2013; Ranjit Singh & Chan, 2014; Sa'Don, Dahlan, & Zainal, 2013; Tangas, 2014; Umar & Hassan, 2015; Young, 2016).

2.1.1 Positive Implications of ICT Integration on Students

To illustrate further, some studies focus specifically on identifying the impact of ICT on students, being the end-receiver of such educational initiatives. For example, Cameron (2015) reported that based on a case study involving preschool pupils in Colorado, USA, digital technology integration was useful to scaffold and reinforce the pupils' information-searching skills, as well as to expand the pupils' knowledge of the world through applications such as Skype, Twitter and Kidblog. In the study, the type of technology was "deliberately chosen" by the classroom teachers to meet the children's developmental needs, learning goals and curriculum (Cameron, 2015:90).

In a large-scale study involving high school students in the Southcoast region of Massachusetts, USA, Hegedus, Dalton and Tapper (2015) found that using technology to teach advanced algebra lessons positively affected student learning. The group of students who were involved in learning Mathematics in an interactive, technology-rich environment using SimCalc application were able to perform better than other students who experienced traditional classroom

teaching and learning of advanced algebra lessons (Hegedus et al., 2015). This finding replicates an earlier study conducted by Chandra and Briskey (2012) who found that the use of ICT, especially web-based applications to teach Mathematics, gave a positive impact on high school students in Australia. One of the key findings in the study by Chandra and Briskey (2012:81) was that the students viewed the "convenience of self-paced learning" when using ICT for their study as a great motivator considering some students tended to have less confidence in subjects like Mathematics. The ability to do self-paced learning is currently often associated with the use of a VLE because as long as students have access to the internet connection, they can study and do their homework or revision at anytime and anywhere (Chua, 2012; Hutchings & Quinney, 2015; Soon, 2014).

Meanwhile, based on focus group sessions conducted among teachers and education consultants in Quebec English schools in Canada, it was reported that with the integration of ICT into teaching and learning, students were observed to have higher interest and participation in lessons, as the students were able to explore educational resources beyond the traditional classroom and textbooks (Rabah, 2015). The results from this study correspond with an earlier report by Voogt and Plomp (2010) who highlighted findings from the Second Information Technology in Education Study (SITES), a study involving multiple countries such as Norway, South Africa, Israel and Hong Kong Special Administrative Region. Findings from SITES suggested that ICT-enhanced teaching and learning offered "active/productive learning activities" and helped to develop students' "lifelong learning skills" or "21st century skills" (Voogt & Plomp, 2010:449). In addition, several studies on the impact of the VLEs on education have also pointed out the

opportunity for students to engage in interactive learning activities by accessing an enormous amount of educational resources beyond the classroom walls and outside the formal school or lecture hours (Hassan & Mohsin, 2015; Lameras, Levy, Paraskakis, & Webber, 2012; López Gavira & Omoteso, 2013; Md. Keling et al., 2013; Risquez et al., 2011; Tunmibi, Aregbesola, Adejobi, & Ibrahim, 2015).

2.1.2 Complexity and Negative Impacts of ICT Integration on Students

The report and studies quoted in 2.1.1 demonstrate some examples of the potential benefits of ICT integration for teaching and learning from several countries around the world. However, some researchers and scholars have emphasised that caution should be observed when discussing the impact of ICT in education due to the complexity of technology integration (Biagi & Loi, 2013; M. Burns, 2013; Cuban, 2001; De Witte & Rogge, 2014; Hammond, 2014; Jones & Cowie, 2011; Kozma, 2011; Umar & Hassan, 2015). According to De Witte and Rogge (2014), it is difficult to generalise findings related to the impact of ICT especially on students' attainment. Kozma (2011) argued that positive results in students' assessments cannot be assumed to be directly associated with computer use. There are many other variables that must be taken into consideration when investigating the impact of ICT integration on students.

For instance, Burns (2013) highlighted that previous findings showing positive correlations between computer use and student academic performance also indicated that the students came from higher socio-economic status. Furthermore, some studies were conducted involving limited or short periods of time and using indicators which some critics have highlighted as inappropriate to measure ICT use (Burns, 2013; De Witte & Rogge, 2014). Arguments regarding

the time frame was associated with the suggestion that every teacher and student acquired a different pace in getting accustomed to teaching and learning with ICT integration. Therefore, the results obtained within the limited research time frame could also be influenced by the differing pace required by either the teacher or students in developing skills and familiarity with ICT-enhanced teaching and learning. Other researchers such as Biagi and Loi (2013) and Spiezia (2010) also highlighted the intricacies of ICT in education by suggesting that changes in learning outcomes could be the result of a combination of factors. These factors included students' competency level, teachers' and students' ICT skills, accessibility to ICT resources in school and at home, as well as motivation and peer factors.

Findings from previous studies related to ICT integration and students' learning did not necessarily show positive outcomes all the time. For example, Angrist and Lavy (2001) and Pelgrum and Plomp (2002) as cited by Kozma (2011) found negative relationships between computer use in Mathematics and students' scores in the subject. Based on results from the Programme for International Student Assessment (PISA) about the association between students, computers and learning, it was reported by the Organisation for Economic Co-operation and Development (OECD) that utilisation of ICT more intensively than the average OECD level had resulted in "significantly poorer student performance" (OECD, 2015:16). The study suggested that moderate use of computers at school led to better learning outcomes than rare or excessive use of computers.

It is interesting to observe that studies discussing the impact of ICT in relation to specific subjects or learning especially Mathematics, Science and languages, are

more easily available than discussions on other subjects. Coincidently, these subjects are also the focus of international level standardised tests such PISA and Trends in International Mathematics and Science Study (TIMMS). However, Kozma (2011) in his argument highlighted that the goal of ICT in education is not subject-specific. In addition, Livingstone (2012:11) mentioned that policy on ICT in education aims at improving "educational outcomes across the curriculum". Therefore, further studies should also involve other subjects being offered to students, in order to examine the overall implications of ICT in education.

2.1.3 ICT Integration and Teachers' Professional Practice

If students are the end receivers of educational transformation, teachers on the other hand are perceived as important change agents that implement policy and curriculum in practice, and with whom the students generally spend most of their schooling years (Carlson, 2016; Donnelly et al., 2011; Prensky, 2012; Tangas, 2014; Umar & Hassan, 2015). Previous studies on the impact of ICT on teachers have indicated that they experienced improvements in their professional practice (Tangas, 2014; Tunmibi et al., 2015; Umar & Hassan, 2015; Wang, Hsu, Reeves, & Coster, 2014). Currently, there has been no formal definition of 'teachers' professional practice' but researchers and scholars have referred to professional practice as responsibilities associated with many different aspects of teaching including planning and preparation of lessons, execution of the lessons and classroom management, communication with students and parents, as well as other obligations such as collaboration, professional development and administration (Bahagian Pendidikan Guru, 2009; Danielson, 2008; Danielson & McGreal, 2000; Department of Education and Training Australia, 2006; Jones & Cowie, 2011; The Teaching Council Ireland, 2012).

To illustrate the positive impact of ICT on teachers, Hegedus et al. (2015), Umar and Hassan (2015) and Tunmibi et al. (2015) reported that teachers in their studies were able to explain certain learning concepts more effectively. For example, ICT enabled teachers to use 3D visualisation to explain about the organs of a human body, or show videos of people, places and languages spoken in other countries. Meanwhile, in a study conducted by Howard, Chan, and Caputi (2015) involving English language, Mathematics and Science teachers in the state of New South Wales, Australia, it was revealed that Science teachers reported a higher frequency of ICT integration, followed by English language teachers and finally teachers who were teaching Mathematics subject. Findings from the three years of data collection for this study suggested that subject areas did matter in technology integration (Howard et al., 2015). Teaching and learning for the Science subject could benefit from 3D visualisations and simulation programmes. However, Mathematics is a subject that emphasises the ability to present and explain calculation procedures. Thus, in an earlier report Wastiau, Pagano, and Garoia (2013) suggested that one potential reason contributing to the lower ICT integration level by Mathematics teachers was the lack of motivation to experiment with innovative teaching pedagogy due to the conventional assessment methods still adopted for the subject.

Integration of ICT in education has also allowed teachers to implement more student-centred activities such as inquiry-based and project-based learning (Garrett Dikkers, 2015; Hegedus et al., 2015; Tunmibi et al., 2015; Umar & Hassan, 2015). According to Garrett Dikkers (2015), teaching and learning that incorporates a VLE can allow the students to investigate the subject content and

discuss their understanding of the lesson with their classmates and teacher, via blogs or discussion boards in the VLE. Garrett Dikkers (2015) also reported that teachers in her study, who blended the VLE with face-to-face teaching, found themselves to be more organised and reflective of their daily instructional strategies, replacing ineffective methods with a greater diversity of technology tools to support teaching and learning.

Carlson (2016) highlighted that the teachers and school administrators in his study capitalised on the common software that they were using, as well as social media to create abundant opportunities for formal and informal collaborations and sharing of ICT in education practices. In addition, Simin and Sani (2015) reported that teachers in their study were able to benefit from the teaching resources available on the VLE platform by using or adapting the resources to design interesting and engaging lessons suitable for their students. Therefore, as illustrated by the findings from the previous studies, it is evident that integration of ICT (including the VLE) in teaching and learning can potentially bring positive implications on the teachers' professional practice.

2.1.4 ICT As an Important Agenda in Education

Despite the mixed and inconclusive results pertaining to the impacts of ICT in education, investments and emphasis on integration of ICT in teaching and learning continues to be part of the agenda for Ministries of Education in both developed and developing countries. For instance, a study commissioned by the UNESCO Institute of Statistics (UIS) indicated that the majority of countries in Asia are aware of the need for ICT exposure and skills to prepare students for the 21st century. As a result, many of the countries have their own ICT in

education policy or at least a framework of formal commitments. Countries or economies such as Japan, the Republic of Korea, Singapore, the Philippines and Malaysia have “stand-alone, sector-wide ICT in education plans” (Wallet & Valdez, 2014:10).

Furthermore, the OECD indicated that based on data between 2010 and 2012, the majority of developed countries spent approximately between USD70,000.00 to USD120,000.00 on education for students from the age of 6 to 15 years old. Meanwhile, most of the developing countries taking part in the study spent between USD10,000.00 to USD50,000.00 on education (OECD, 2015). Although education expenditure could have been used for areas such as teachers’ professional development, salary or other educational resources, the OECD highlighted an increase in investments for computer hardware, software and connectivity. In addition, the student and computer ratio for the developed countries ranged between the higher end of 6:1 to 1:1 while the ratio in developing countries taking part in the study ranged from between 63:1 to 4:1 (OECD, 2015).

In spite of the enormous gap in the student to computer ratio depicted by some of the developing countries, the effort shown by those countries via the investments proves that ICT in education is deemed essential for students’ learning experience. The current younger generations who are mostly still studying at various levels will one day become the leaders and workforce in their respective countries. They will be the ones to steer their nations to further developments, surviving in the competitive global economy while living a progressive life as citizens, families and individuals. Hence, to prepare these younger generations for the future, educational policies in many countries evolve

in an attempt to be as up-to-date as possible with the socio-economic development and changes happening around the world. Indeed, the widespread importance of ICT across various fields, and its potential benefits as described earlier, are among the motivations for the continuous investments and inclusion in many educational policies nowadays.

As the Ministries of Education in many countries continue to highlight the importance of ICT in education, it is essential for policymakers and stakeholders to collaborate in the quest to attain the policy objectives as well as gaining the return-on-investment. As highlighted earlier, teachers form a significant group among the stakeholders in the education system, because they translate and carry out policy in practice (Carlson, 2016; Donnelly et al., 2011; Prensky, 2012; Tangas, 2014; Umar & Hassan, 2015). Apart from that, in the UIS report, Wallet and Valdez (2014) acknowledged and cited findings by Tyack and Cuban (1995) and Cohen and Hill (2001) regarding the possible reasons for policy failure which included the following:

(i) Policy was viewed as mere symbolic gestures;

(ii) Teachers actively resisted policy-based changes due to a lack of participation or involvement in the policy-making process;

(iii) Policy did not have explicit connections to instructional practice (focusing too much on hardware rather than pedagogy);

(iv) Teachers did not have the opportunity to understand the policy and its instructional implication;

(v) Lack of programme and resource alignment to the policy's intentions.

Based on the points highlighted above, it is clear that teachers play a crucial role in determining the success or failure of the educational policy, including those in connection with ICT in education, as teachers are specifically related to points (ii), (iii) and (iv) above. Thus, it is worth investigating factors that influence teachers to either support or decline certain policy implementations, so as to accomplish the policy objectives.

2.2 SIGNIFICANT FACTORS INFLUENCING TEACHERS' INTEGRATION OF ICT IN EDUCATION

Introducing a policy that encourages teachers to integrate ICT in their professional practice can lead to a change from previous routine, at least to some, if not all of the teachers. Clarke and Hollingsworth (2002) proposed a perspective that associated teacher change with growth or learning, viewed as part of the professional activities of teachers working in a learning community. In other words, it is important to involve teachers in continuing professional development (CPD) programmes in order to instigate change in the teachers' professional practice (Clarke & Hollingsworth, 2002). The following is a definition of CPD according to Day (1999) as cited by Murphy and de Paor, (2017:243):

> "Professional development consists of all natural learning experiences and those conscious and planned activities which are intended to be of direct or indirect benefit to the individual, group or school…It is the process by which, alone and with others, teachers review, renew and extend their commitment as change agents".

The definition of CPD as quoted above signifies a shift in focus regarding the conception of change. Teacher change used to be implied as something that is imposed on teachers through isolated workshops aiming to repair a deficit in the teachers' skills and knowledge (Clarke & Hollingsworth, 2002). Since past studies

have revealed ineffectiveness with regard to teacher change and isolated workshops, the implementation of effective CPD promotes on-going and life-long learning for teachers. Such CPD enables teachers' self-development via formal and informal learning activities, meaningful discussions as well as collaborations with colleagues, mentors and other professionals (Clarke & Hollingsworth, 2002; de Vries, van de Grift, & Jansen, 2013; S.-H. Liu, Tsai, & Huang, 2015; Murphy & de Paor, 2017; van den Bergh, Ros, & Beijaard, 2015).

Academic discussions around factors influencing teachers' change and ICT integration often involve some analysis and understanding of the barriers to change, because previous studies have cited that barriers can hinder implementation efforts (Buabeng-Andoh, 2012; Donnelly et al., 2011; P. Ertmer, 1999; P. A. Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012a; Goktas, Gedik, & Baydas, 2013; Jasmi, Tamuri, Ilias, & Mohd Hamzah, 2011; X. Liu & Pange, 2014). Barriers to teachers' ICT integration are usually divided into two categories known as first-order and second-order barriers to change (Alleman, 2013; P. Ertmer, 1999; X. Liu & Pange, 2014).

2.2.1 Barriers to Change and Teachers' Beliefs

According to Alleman (2013), Ertmer (1999) and Liu and Pange (2014), first-order barriers refer to extrinsic problems such as inadequate resources, support and time. Previous studies related to teachers' integration of ICT in education have revealed plenty of examples pertaining to first-order barriers. For example, it has already been suggested that integration of ICT in education requires large infrastructural and financial investments (OECD, 2015). In addition, Albugami and Ahmed (2015), Rabah (2015) and Liu and Pange (2014) reported inconsistent or

insufficient investments and inflexible funding arrangements that have caused difficulties for some schools in acquiring or maintaining the ICT hardware, and in organising training or CPD sessions for teachers. Previous studies have also indicated that teachers required consistent technology-related professional development sessions because they lacked the relevant skills to integrate ICT in teaching and learning (Albugami & Ahmed, 2015; Rabah, 2015; Raman & Yamat, 2014).

Based on a quantitative study involving a school in Malaysia conducted by Termit and Noorma (2015), one of the reasons for the teachers' failure to utilise Frog VLE was due to the inability to grasp or comprehend the knowledge and skills they received from the VLE-related training and CPD courses. Researchers have pointed out that the integration of ICT in education is a complicated process. For example, the rapid development of ICT makes it difficult for teachers to acquire and master integration skills because new innovations and technology keep coming in (Campbell, Al Harthi, & Karimi, 2015; Carlson, 2016; P. A. Ertmer et al., 2012; Fitzgerald, 2015; Ghavifekr et al., 2014; M. Koehler, Mishra, & Cain, 2013).

As human beings, teachers differ from one another in their responses and pace to acquire the ICT integration skills. For example, while some teachers are probably still new to using interactive whiteboards for teaching and learning, other teachers are already exploring the technology to optimise and enrich students' learning experiences. Therefore, when newer technology such as the VLE is introduced as another ICT initiative that potentially helps to enhance access to education, teachers who are still learning to capitalise from the interactive

whiteboards now face an additional challenge because they have to learn how to integrate two types of technology. This additional challenge can affect the teachers' decisions for technology integration because as indicated by Donnelly et al. (2011:1469), teachers are less likely to be motivated to change if they believe that the changes are associated with "intensification of teachers' work".

It is believed that implementing relevant strategies can eliminate these first-order barriers. For instance, if the problem is inadequate infrastructure, hence adding more hardware is possibly the obvious solution. Similarly, increasing the number of relevant training and organising regular CPDs are probably the answer to tackle insufficient support that relate to teachers' lack of competency in using the technology. Nonetheless, although it is easy to suggest solutions to overcome the first-order barriers, trying to solve some of the first-order problems appear to be more complicated and less straightforward. In recent years, there has been increased emphasis for policymakers and the relevant stakeholders to address *how* the teachers utilise ICT in teaching and learning (Chandra & Briskey, 2012b; Tondeur et al., 2016).

In a study conducted among teachers in New Jersey, USA, it was discovered that although the teachers positively perceived the ICT trainings they have attended, their classroom ICT integration was reported to be at a superficial level (Johnson-Martin, 2012). A similar situation was reflected in a study conducted to investigate factors influencing the use of ICT for classroom purpose among Korean teachers. Based on the study, Won (2010:140) indicated that despite recognising the possibilities of technology and "regarded themselves as innovative", some of the teachers did not implement technology-related teaching and learning because

"they did not know how to integrate technology in a meaningful way". Therefore, training and CPD sessions on ICT in education should be aimed at guiding and giving ideas to teachers on the possible meaningful ways to incorporate ICT as an enabler to make teaching and learning more student-centred whilst achieving the lesson objectives (Soon, 2014). Addressing the *how* to integrate ICT in education will affect the teachers' beliefs, an area that will be discussed further in this section.

Meanwhile, Al Asmari (2011) as cited by Albugami and Ahmed (2015:41) reported that teachers in Saudi Arabia "suffer from lack of time to prepare ICT materials for lessons". The additional time required to successfully integrate technology into the classroom became one of the factors that made the teachers unenthusiastic about using ICT in their teaching practices. In an impact study on the Smart School Integrated Solution (SSIS), a nationwide programme that saw the beginning of Malaysia's more structured investment on ICT in education, it was reported that the most significant difficulty faced by the teachers was insufficient time in preparing for lessons (Frost & Sullivan, 2006). Similarly, Raman and Yamat (2014) and Simin and Sani (2015) reported that based on their studies in Malaysia, some teachers cited lack of time as a barrier to ICT integration for teaching and learning. The teachers associated the lack of time with their responsibilities to complete the year's subject syllabi as well as other professional tasks such as keeping up-to-date records of the students' profiles, as well as preparing, marking and documenting students' assessments. Again, to a certain extent, the responses from these teachers might indirectly be the result of their pedagogical beliefs.

Kim, Kim, Lee, Spector and DeMeester (2013) stated that there is no consensus in defining teachers' beliefs in relation to technology integration. However, teachers' beliefs, which are part of second-order barriers, are often related to the teachers' "philosophy about teaching and learning" and "their conception of knowledge" (Sang, Valcke, van Braak, Tondeur, & Zhu, 2011:161). Individual teachers' definitions of the purpose of education, their teaching styles, perceptions on students' examinations and assessments, and their opinions on whether or not technology will benefit their teaching and learning are part of the teachers' beliefs. According to de Vries, van de Grift, and Jansen (2013), teachers' beliefs regarding teaching and learning develop over time beginning from when the teachers were students, then as student teachers and subsequently with their experiences as teachers. As second-order barriers, teachers' beliefs pose a significant impact on implementing educational innovations, yet are difficult to tackle because these barriers are less tangible and more personal to the teachers (Donnelly et al., 2011; P. Ertmer, 1999; Frank & Zhao, 2003; Kim et al., 2013; Vanderlinde, Aesaert, & van Braak, 2014).

2.2.2 Teachers' Beliefs and Continuing Professional Development (CPD)

Soon (2014:16) emphasised that it is very important to get the "buy-in from all stakeholders" in order to successfully implement VLE or other ICT in education initiatives. As an important stakeholder in the education system, teachers need to be exposed to training and CPD sessions that highlight the advantages of ICT for teaching and learning as well as addressing *how* to integrate ICT in education. It has been highlighted earlier in 2.2 that teachers' involvement in CPD programmes is important to promote change in professional practice. Teachers' decisions related to their professional practice, such as regarding the selection of

pedagogical strategies and resources, including whether or not to incorporate teaching and learning with technology, are partly influenced by their beliefs on what they think students will find engaging and helpful for their learning (Howard, Ma, & Yang, 2016; Kim et al., 2013).

In a study investigating the relationship between teachers' beliefs and their participations in CPD, de Vries et al. (2013) reported that there was positive association between student-centred beliefs and teachers' participation in CPD activities. In particular, the finding indicated that the more teachers focused on student-oriented, the more they participated in the three types of CPD activities defined for the study, namely updating tasks, reflecting on their work, and collaborating with their colleagues (de Vries et al., 2013). In the meantime, Siew Ming, Azman, and Joyes (2010:2) reported that based on their review of the Smart School initiative implemented by MoE Malaysia, integration of ICT into professional practice required "teachers who themselves understand and believe in the capacity of the new technologies to transform learning in positive ways". This was also supported in another finding by Howard, Chan and Caputi (2015) who stated that for teachers to conduct technology-enhanced lessons, they must hold the belief that integration of ICT could support the teaching and learning outcomes. Hence, when aiming for buy-in, it is necessary to gain trust from the stakeholders by convincing them with the potential benefits that students as well as the teachers themselves can reap from the VLE or other ICT in education initiatives.

Ertmer et al. (2012:433) suggested that "the best way to bring more teachers on-board is not by eliminating more first-order barriers, but by increasing more

knowledge and skills, which in turn have the potential to change attitudes and beliefs". Therefore, in order to try changing the attitudes and beliefs, teachers must be given the opportunity to participate in CPD and hands-on sessions. It is also important that the CPD sessions must be suitably tailored to include knowledge on *how* to utilise the technology to enhance education. This is vital so that teachers are aware of the technology's perceived advantages in order to confidently maximise the potential output and outcome for teaching and learning. Otherwise, if teachers are neither convinced nor comfortable, they tend to resort to using the VLE or any other ICT in education initiatives at a superficial level or in a less meaningful way, as depicted in previous studies conducted by Johnson-Martin (2012) and Won (2010).

2.2.3 The Interconnected Model of Teacher Professional Growth

When further discussing change in teachers' beliefs, Clarke and Hollingsworth (2002:947) highlighted the need to understand the process "by which teachers grow professionally and the conditions that support and promote that growth". In their discussion, Clarke and Hollingsworth (2002:949) have cited Guskey's (1986) alternative model that depicts the process of teacher change, in which "significant changes in beliefs and attitudes are likely to take place only after changes in student learning outcomes are evident". This is in the reverse order to the typical expectation of many conventional trainings or CPD programmes whereby the assumption is that changes in teachers' beliefs and attitudes will lead to changes in their classroom practices and behaviours, therefore influencing changes in the students' learning outcomes (Clarke & Hollingsworth, 2002). Nonetheless, Guskey's model was criticised because it portrayed teachers' change as a linear process. Therefore, deriving from the elements of

teacher change in Guskey's model, Clarke and Peter (1993) developed the Interconnected Model of Teacher Professional Growth as represented in Figure 1 in this thesis.

As described by Clarke and Hollingsworth (2002) and Clarke and Peter (1993), the Interconnected Model of Teacher Professional Growth consists of four domains that encompass a teacher's change environment. The personal domain represents the teacher's knowledge, beliefs and attitude regarding education, teaching and learning. In addition, van den Bergh, Ros, and Beijaard (2015) have identified teachers' willingness to learn as a crucial feature associated with attitude in the personal domain. On the contrary, the domain of practice relates to the teacher's professional experimentation, or when the teacher field-tests the educational change proposal or new knowledge. Meanwhile, the domain of consequence refers to salient outcomes as a result of the professional experimentation. Clarke and Peter (1993:170) suggested that the consequences include various outcomes such as "student learning, teacher satisfaction, teacher planning effectiveness and efficiency, reduced teacher classroom stress, and increased student and teacher classroom enjoyment".

On the other hand, the external domain is associated with the sources of information, stimulus or support that the teacher gains in relation to implementing the change proposal. Some examples of the components in external domain are CPD programmes, educational resources, academic reading materials, meetings and discussions with colleagues as well as other professionals, and the different types of support, such as moral encouragement, financial allocation, expertise

and provision of infrastructure provided by the academic institution as well as other stakeholders.

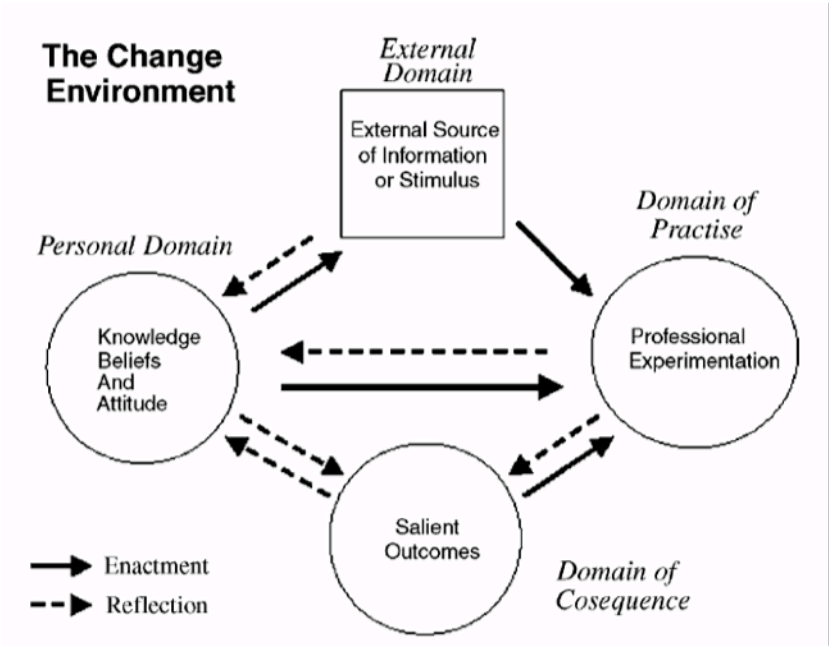


Figure 1: Interconnected Model of Teacher Professional Growth

One of the key features of the Interconnected Model of Teacher Professional Growth that differentiates it from Guskey's alternative model is the suggestion that change occurs through the non-linear mediating processes of enactment and reflection, as illustrated in Figure 1. The term 'enactment' relates to the process of putting into action the component in one change domain and linking it with the other change domain (Clarke & Hollingsworth, 2002; Clarke & Peter, 1993). Reflection has been recognised as an important practice in the field of education (Farrell & Jacobs, 2016; Luttenberg, Meijer, & Oolbekkink-Marchand, 2017). Literature discussing reflection or reflective practice among teachers has echoed the definition provided by Dewey (1910:2) whereby it is associated with "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions". As simplified by Farrell and Jacobs (2016) and Luttenberg, Meijer, and Oolbekkink-

Marchand (2017), reflection is an act of conscious thinking about the things individuals do and the reasons for doing them, which can result in greater awareness regarding an issue, or as a medium to instigate change.

To further illustrate the enactment and reflection process, findings from the study conducted by Liu, Tsai and Huang (2015) regarding collaborative professional development of mentor teachers and pre-service teachers in relation to technology integration are referred to as an example. The study was conducted in post-primary schools in Taiwan, highlighting collaborative work as part of a CPD programme between pre-service teachers and their experienced in-service mentor teachers. Participants in the study were involved in practical teaching and classroom observations that include lessons with technology integration. They were also involved in focus group interviews as part of the reflection process.

Based on the study, the pre-service teachers were generally more skilful with technology compared to their mentor teachers. On the other hand, the mentor teachers demonstrated higher confidence and skills in relation to pedagogical and content knowledge (Liu et al., 2015). Here, the number of teaching years and experience demonstrated by the mentor teachers proved to be among the reasons for the degree of pedagogical confidence and mastery of content knowledge and skills. In relation to the Interconnected Model of Teacher Professional Growth, the pre-service teachers' technological knowledge represents their personal domain. From the perspective of the pre-service teachers, the external domain includes their observation of the mentor teachers' technology-enhanced classroom teaching and learning.

In addition, discussions and collaborative work that occurred between the pre-service teachers and their mentor teachers were also part of the external domain. In this study, enactment process was identified as it linked the personal domain with the external domain, whereby the pre-service teachers contributed their technological knowledge and expertise to help diversify the mentor teachers' classroom teaching and learning activities (Liu et al., 2015). Similarly, the pre-service teachers, having gained ideas and examples regarding pedagogical strategies to deliver content to students, became more motivated to enact their technological knowledge by creating and implementing their own lessons with ICT integration (linking personal domain and external domain to domain of practice).

The process of reflection was also evident in the study. For instance, some of the mentor teachers reported that based on their observation of the teaching activities conducted by the pre-service teachers involving other features of the technology besides PowerPoint slides, there had been an increase in "student motivation and comprehension of course contents" (Liu, Tsai, & Huang, 2015:166). The positive changes observed in the students' learning are salient outcomes related to the domain of consequence in the Interconnected Model of Teacher Professional Growth.

Realising the favourable outcome, the mentor teachers were reported to be more motivated "to actively learn technological skills from those pre-service teachers" and "increasingly adopt various technologies to assist students in comprehending abstract concepts and increasing their learning motivation" (Liu, Tsai, & Huang, 2015:167). Hence, this finding firstly provides an interpretation of the processes

described in the Interconnected Model of Teacher Professional Growth. Secondly, it is also a testimony to Guskey's suggestion which was stated at the beginning of this section, whereby "significant changes in beliefs and attitudes are likely to take place only after changes in student learning outcomes are evident" (Clarke & Hollingsworth, 2002:949).

2.2.4 Using Technological Pedagogical and Content Knowledge (TPACK) To Understand Teachers' ICT Integration

Carlson (2016) suggested that one of the ways to understand the impact of technology on teachers' professional practice is by using Technological Pedagogical and Content Knowledge (TPACK). This is because TPACK helps to provide a framework for understanding the relationship between teachers and technology. Koehler and Mishra (2009) have developed the TPACK framework which was expanded based on the original descriptions by Shulman (1987). In the earlier version by Shulman (1987), he described how teachers' understanding of pedagogical knowledge (PK) and content knowledge (CK) interact to result in what is known as a pedagogical content knowledge (PCK). Recognising the growing significance of ICT in the 21st century, researchers such as Angeli and Valanides (2005) and Mishra and Koehler (2006) included technological knowledge (TK) as an extension to the PCK framework. The TPACK model as illustrated in Figure 2, is described as having three main components of teachers' knowledge, namely the technological knowledge (TK), pedagogical knowledge (PK) and content knowledge (CK).

CK refers to the teachers' mastery of the subject matter, such as facts and concepts related to Mathematics, Science, Arts and languages. PK includes the

teachers' planning and implementation strategies for the lesson. In other words, PK is associated to how the teachers present the lesson to the students and create the learning environment, such as via group discussions, inquiry-based activities or direct explanation. PK is influenced by several factors such as the teachers' understanding and beliefs on education, the students' learning styles, curriculum and assessments (Fitzgerald, 2015). Meanwhile, TK relates to the teachers' familiarity with ICT and their technological skills (Fitzgerald, 2015; M. J. Koehler & Mishra, 2009).

The three components are also interdependent, in which PCK describes when teachers are able to blend between what content to teach and how to deliver the content in the most appropriate method. PCK is derived based on their understanding of the subject matter, the learning objectives and their awareness of the students' prior knowledge as well as learning styles. TPK illustrates the teachers' decision to use what they think is the most suitable technology to support their teaching practices. TPK also emphasises the importance of exposing teachers to continuous professional development that focuses on the effective methods to conduct technology-enhanced teaching and learning. Meanwhile, in teaching and learning, TCK is demonstrated by the teachers' decision to select which technological tools to support the delivery of content to the students. In other words, the choice of technology to use depends on the content of the subject to be taught, also taking into consideration what technology options are available to the teachers and students (Fitzgerald, 2015; M. J. Koehler & Mishra, 2009; M. Koehler et al., 2013).

As represented in Figure 2, the intersection of all the components, described as the TPACK, is the most significant element for integration of ICT in education. According to Koehler & Mishra (2009:66),

> "TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies, pedagogical techniques that use technologies in constructive ways to teach content, knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face…and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones."

Teachers teach effectively with technology when there is awareness, knowledge and skills that will assist them to decide which technology to use in order to help them teach specific content to the students, using the pedagogical approach deemed appropriate for the lesson. Thus, TPACK places emphasises on the overlaps and the intersection between the teachers' knowledge components, whereby each component does not work separately. For instance, giving exposure to teachers about the features of the VLE will possibly increase the teachers' knowledge on the technological aspect of the learning platform.

However, this does not guarantee that the teachers will be able to integrate the VLE platform in order to support teaching and learning. Teachers need to have the competency to decide when and how to utilise VLE so that students will get better understanding and access to the knowledge or learning concept. Thus, by acknowledging the overlaps and intersection as well as not treating teachers' knowledge components separately, TPACK echoes the importance of addressing the *how* to integrate ICT in education, as highlighted earlier in this section.

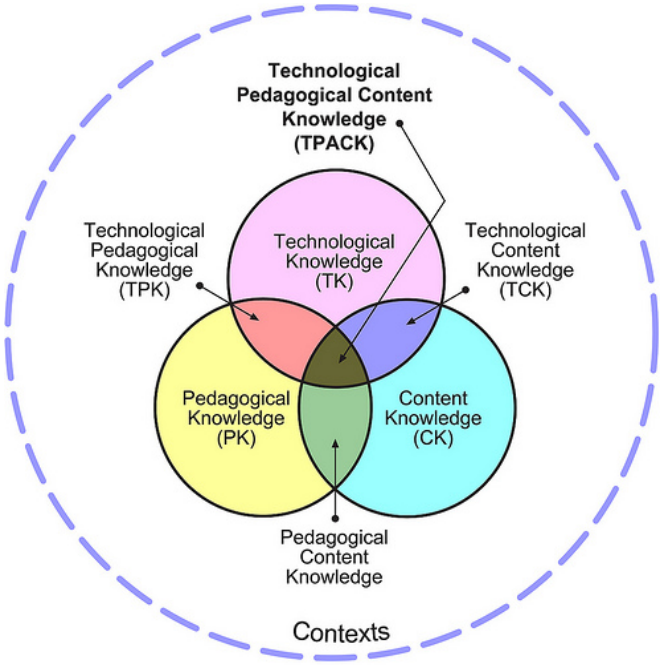


Figure 2: TPACK Model (Koehler & Mishra, 2009:63)

The dotted line labelled as ‘contexts’ in the model serves as a reminder that all interactions between the components are also influenced by specific contexts that include among others educational policies, infrastructure, school culture and support (Koehler et al., 2013). The United Kingdom (UK) Office for Standards in Education, Children’s Services and Skills (Ofsted) indicated that support and commitment from school management and local authority were the main contributors for the best examples of comprehensive VLE utilisation (Ofsted, 2011). Similarly, a case study on the VLE implementation in several post-primary schools in the UK also highlighted the importance of having enthusiastic leaders who would give motivation and support for the teachers to integrate VLE in teaching and learning (Chikwa, 2012). In addition to support from school management, findings from a research by Stanhope and Corn (2014) reported

about the importance of just-in-time technical assistance as a determinant of teacher commitment to technology integration.

2.2.5 Teacher ICT Integration Model

It has been suggested in Section 2.1.4 that as a lot of Ministries of Education around the world extend their investments on ICT in education, there is a need for cooperation among policymakers and stakeholders in identifying and executing measures to intensify and ensure appropriate utilisation of the educational technology provision. For that reason, it is important for policymakers to seek more understanding regarding factors that contribute to teachers' utilisation or non-utilisation of the ICT in education programme. The earlier discussions in this section have highlighted the importance of understanding and acknowledging the domains and processes that lead to teacher change. It is also significant to address the problems regarding barriers to teachers' ICT integration and their implications on the teachers' beliefs. In addition, it has been suggested that TPACK can be used to help describe and understand how teachers utilise technological advantages to create pedagogical solutions.

Donnelly et al. (2011) presented a model of Teacher ICT integration as illustrated in Figure 3, which was extended from previous literature and studies on issues affecting teachers' use of educational technology such as by Ertmer (1999), Siorenta and Jimoyiannis (2008) and Zhao, Pugh, Sheldon and Byers (2002). Based on the model (as shown in Figure 3), 'empowerment' or 'ownership' represents teachers who positively treat ICT as providing them with a great avenue to implement innovative and interesting educational activities with their students. In contrast, 'helplessness' or 'fatalism' refers to teachers who believe

that they do not have the capacity to do anything about the ICT in education resources made available to them.

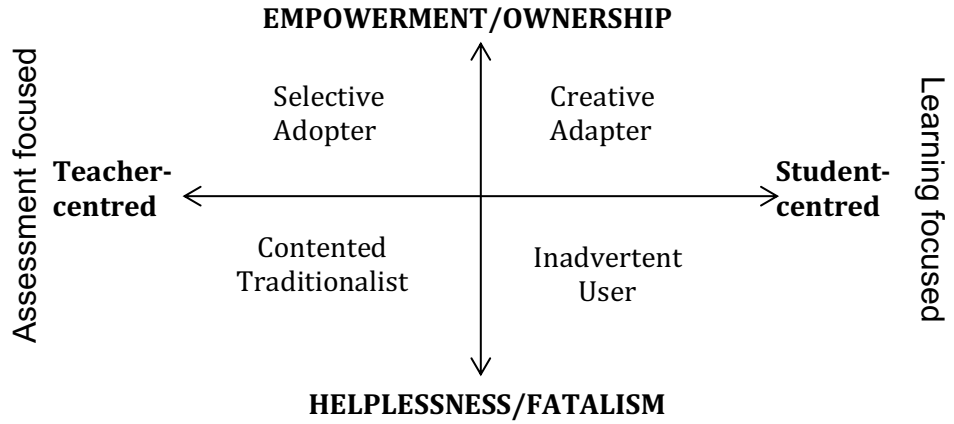


Figure 3: Teacher ICT Integration Model (Donnelly et al., 2011:1477)

In relation to 'learning' versus 'assessment', Donnelly et al. (2011) suggested that teachers who focus more on assessment tend to adopt teacher-centred teaching and learning in order to impart as much content as possible to the students. Therefore, these teachers are usually unable to effectively integrate ICT in their teaching and learning. However, teachers on the opposite spectrum of the model implement more student-centred activities because they believe that teaching and learning should develop students' capabilities in relation to the subject matter (Donnelly et al., 2011).

The teacher ICT integration model divides teachers according to four categories based on their educational beliefs, demonstration of TPACK and sense of purpose in relation to utilising ICT in education (Donnelly et al., 2011). Teachers who are Contented Traditionalists (CT) are more inclined to conduct teacher-centred and assessment-focused activities because they are driven by "extrinsic factors such as the curriculum, the principal, school management etc." Donnelly

et al. (2011:1478). CTs often maintain traditional teaching practices because they either do not see how technology can assist them in delivering the content and pedagogy to the students, or they do not know how to integrate technology in teaching and learning.

The second group of teachers is called the Selective Adopter (SA), who despite having a good sense of ownership of the resources and activities they choose for the lesson, as well as knowledge regarding which technology should be used to support teaching and learning, these teachers often find themselves confined to a more rigid assessment system. Consequently, these teachers will continue to integrate ICT in their teaching and learning but only select digital resources that they believe will help their students "to do better in their final assessment" (Donnelly et al., 2011:1478).

In the third category, the name Inadvertent User (IU) suggests a group of teachers who only use ICT in education due to external factors such as school culture and peer pressure. Thus, although IUs integrate ICT in their teaching and learning, the integration is however involuntary in nature. Finally, the fourth group is called the Creative Adapter (CA), referring to teachers who are strong believers of student-centred learning approaches. CAs are able to utilise a wide-range of educational resources to help students gain better understanding of the content or subject matter. Furthermore, teachers who are CAs demonstrate the knowledge to blend appropriate technological tools with strategies and activities to teach technology-enhanced lessons (Donnelly et al., 2011).

The teacher ICT integration model is therefore beneficial for policymakers and stakeholders who seek to identify and embark on strategies to increase the utilisation of educational technology initiatives as reiterated at the beginning of this section. This is because the descriptors provided in the model give a clear picture of how teachers presently relate themselves in relation to ICT integration for teaching and learning. Thus, policymakers and other relevant stakeholders are able to plan and carry out suitable actions. As suggested by Donnelly et al. (2011), pedagogical professional development courses will help teachers in the categories of CT and IU to move to the upper quadrants (CT to SA, IU to CA). The pedagogical professional development courses can be conducted at various points such as school-level in-house training and CPD sessions, also other sessions at district, state, national or international levels. Nonetheless, again as highlighted earlier, special attention needs to be given to expose teachers to *how* to integrate ICT in education, not merely teaching these teachers the technological skills. This is important so that the teachers will gradually be able to positively shift their beliefs and willingly incorporate educational technology in a more meaningful way for the students' learning.

In the meantime, according to Donnelly et al. (2011), the transitions from SA to CA or CT to IU require changes in environmental factors or other mandated changes. These changes include examples such as policy reforms, improvements in curriculum and assessment systems as well as the school culture. Hence, changes in environmental factors demand substantial decisions from the policymakers or the school authorities before such transitions can take any effect.

2.3 ROLE OF TEACHERS IN MEDIATING ICT INTEGRATION

It has already been highlighted that teachers are regarded as key personnel in executing educational policy and strategic plans into actions. According to Thornton (2001) as cited by Hsu (2011:849), teachers are "the gate keepers of the curriculum" because they design lessons and decide the type of tasks as well as instructional activities to be completed by the students. Many aspects of education including the curriculum and pedagogy evolve in line with changes to the socioeconomic and political developments of specific nations and the world in general (Ministry of Education Malaysia, 2013). Nowadays, a lot of focus is also given to the changing nature of student education to provide them with relevant skills, competencies and ability to contribute effectively to the future workforce and society (Morris, 2014). As a result, the roles of teachers are also expected to transform because as the gatekeepers and lesson designers, they need to provide suitable tasks and activities that reflect the changes and developments stated above (Ministry of Education Malaysia, 2013; Morris, 2014).

2.3.1 Implications on Teacher-Student Relationship

The exponential growth of ICT coupled with easier access to the world wide web have led to the demand for more student-centred learning and digital classrooms as well as the VLE to support the development of 21st century skills (Kong et al., 2014; Prensky, 2012; Soon, 2014). Consequently, there is anticipation for the role of teachers to change compared to the traditional teaching role and related methods employed in the 20th century and earlier. Traditionally, the teacher is perceived as the direct content provider for the students (Ministry of Education Malaysia, 2013). However, the transformation of the teachers' role can be as reflected by Scott (2015:14),

> "If the main goal of twenty-first century education is to build the learning capacity of individuals and support their development into lifelong, active, independent learners, then teachers need to become 'learning coaches'…Learning coaches may provide guidance to help students develop skills, but their main role is to offer the kinds of support that will help students attain their learning goals".

Previous studies have suggested that students' learning goals may be achieved via personalised learning through collaborative and interactive activities (Scott, 2015). Furthermore, Salvador, Mariz, Fernandes and Santos (2017) reported that based on their study, personalised learning which is one of the attributes of VLE, has shown to be an optimiser of effective learning for students. In order to support students with a range of competencies and skills needed to succeed in modern global societies, teaching and learning focus more on interactive learner-led activities that create greater opportunities for inquiry-based learning, enabling students to develop 21st century skills involving critical thinking, creativity, collaboration and communication (Scott, 2015; Tondeur et al., 2016; Voogt & Plomp, 2010). As a result, teachers in 21st century classrooms act as facilitators who grant their students opportunities to engage in interactive learning with their peers (Morley, 2015; Scott, 2015; S. K. Wang, Hsu, Campbell, Coster, & Longhurst, 2014).

Morley (2015) and Wang et al. (2014) have described how the increasing demand for ICT integration and the shift to student-centred learning has changed the teachers' role. When teachers become facilitators, they are no longer the focal point for information in the classroom. In contrast, knowledge acquisition in 21st century classrooms is a shared process, with the students exploring for meaningful information via individual and group tasks while the teacher monitors

and gives feedback on the students' findings (Carlson, 2016; Morley, 2015; Yin, 2013). Yin (2013) suggested that this shared process is positive because it helps to develop a sense of belonging and group dynamic. However, Yin (2013) also highlighted that some teachers in his study were concerned over the changing role of the teachers as technology integration was perceived as lacking in the human factor. Hence, the students may lose their communication skills and the "teacher-student bond" (Yin, 2013:83).

Nevertheless, according to some other literature, the changing role of the teachers did not seem to decrease their importance in crafting students' learning experience. For example, Hsu (2011:849) quoted a previous study by Baylor and Ritchie (2002) who reported that students "who work alone with little or no input from the teacher" experienced negative development in their higher-order thinking skills if compared to students who were exposed to constructivist learning activities. In addition to that, Risquez et al. (2011) reported that the use of VLE in higher education institutions have increased the level of communication between the students and their lecturers.

Meanwhile, Belair (2012) highlighted that students in previous studies felt a need for consistent teacher communication and guidance so that they could feel more confident while accomplishing their virtual learning. Furthermore, findings by Small, Dowell and Simmons (2012) suggested that students valued the importance of student-teacher exchanges in an educational setting because the teachers were perceived as experts. In an example during the Global Education and Skills Forum 2016, education ministers and academic experts unanimously agreed that while technology served as an enabler to students' learning, the

teachers with their face-to-face interaction and counsel would be as relevant as ever (Ronad & Blanco, 2016). Thus, these instances are portrayals of evidence that despite the integration of digital technology and subsequent expectations for changes in the teaching and learning pedagogy, teachers still hold a significant role in the students' educational experience.

Nevertheless, in spite of the crucial transformed role of facilitators who monitor and provide feedback to the students' learning, Comas-Quinn, de los Arcos and Mardomingo (2012:139) highlighted that a common experience pointed out by many teachers in their study on VLE implementation was that they had to spend more time than before in communicating with students, to the extent that a few teachers indicated that the "pastoral role has escalated" or "for some students learning has become dependent rather than independent". Similarly, Simin and Sani (2015) reported that the teachers in their study became frustrated because they realised that the students were too dependent and not taking responsibility for their own independent learning.

The occurrence of such scenario will defeat the purpose of integrating ICT in education, particularly as the opportunity for synchronous and asynchronous teaching and learning made available via a VLE initiative is meant to encourage students to take charge of their learning at their own pace anytime and anywhere (Chargois, 2014; Ministry of Education Malaysia, 2013; Scott, 2015; Tunmibi et al., 2015; Yeung et al., 2012). Thus, taking into account the changing role of teachers in 21st century teaching and learning, it is vital that teachers have the capability to appropriately blend between ICT integration and face-to-face sessions. Teachers need to develop the knowledge and skills regarding when

and how to integrate which technology to support teaching and learning. This is important so that students are exposed to activities that can encourage them to adopt more active roles in their own learning without depending too much on the teachers.

2.3.2 Use of VLE in Teaching and Learning

Although the VLE has been used to support or enhance teaching and learning for many years, discussions regarding this ICT in education initiative are still relevant because previous studies have indicated that many features of the VLE have not been fully exploited by its intended users (Álvarez, Martín, Fernández-Castro, & Urretavizcaya, 2013; Lameras et al., 2012; National Audit Department Malaysia, 2013; Soon, 2014). According to Laurillard (2005), VLE can be used to provide access to five types of processes in relation to teaching and learning, namely *narrative* media to assist understanding or apprehension of concepts, *interactive* media for investigating and exploring further information related to the lesson, *communicative* media for synchronous and asynchronous discussions, debates, instructions and announcements, *adaptive* media for experimenting and practising knowledge and skills acquired from the lesson and finally *productive* media for expressing and presenting for instance ideas, findings and lesson plans.

Nonetheless, studies have indicated that the use of the VLE is “predominantly in narrative and interactive modes to offer students access to digital content” (Lameras, Levy, Paraskakis, & Webber, 2012:143). A similar description has been commonly used to describe the functions of the VLE, mainly as an online learning platform to support face-to-face teaching and improve students’ learning

process because it offers a repository for course documents, opportunity for collaborative, inquiry-based learning and a variety of communication options such as discussion forums and chat boxes (Álvarez et al., 2013; Y. P. Chua & Chua, 2017; FrogAsia, 2016; Mueller & Strohmeier, 2011; Sinayigaye, 2010; Small et al., 2012; van Raaij & Schepers, 2008; Yang, Chuang, Li, & Tseng, 2013).

Referencing Laurillard's (2005) descriptions of VLE use, Lameras, Levy, Paraskakis and Webber (2012) conducted another study investigating blended university teaching using the VLE. Findings from the study revealed four categories of VLE use; information transfer (Category A), application and clarification of concepts (Category B), exchange of ideas, as well as investigation and sharing of resources (Category C) and collaborative knowledge creation and development of process awareness and skills (Category D). Category A emphasises on using VLE to provide students with ‘any time’ and ‘any place’ access to administrative and subject-related content. Teaching and learning is content-oriented with the teachers viewing the VLE as “an efficient, one-stop repository for items” (Lameras, Levy, Paraskakis, & Webber, 2012:145).

Category B is described as an extension of Category A whereby apart from presenting students with the subject-related content materials, VLE functions as a medium to engage the students in tasks involving analysis and practical application of the subject content or theories. Apart from that, VLE use in Category B also emphasises on assessments, interactions and feedback to gauge the students’ understanding and performance in relation to the subject content. Here, the teacher plays an important role as the students’ digital proxy in guiding and giving responses regarding conceptual understanding of the

subject. As a result, despite using the VLE to blend teaching and learning, Categories A and B are still considered to be adopting a teacher-focused, content-oriented approach (Lameras et al., 2012).

This is in contrast with the descriptors for VLE use in Categories C and D. In Category C, the focus of VLE use is "to help students negotiate, further develop and change their understanding through engagement with tasks that encourage open-ended interaction between peers as well as the teacher" (Lameras, Levy, Paraskakis, & Webber, 2012:147). The teacher's priority in Category C is to provide opportunities for the students to explore and express their opinions, whilst engaging with and potentially debating the topic with their peers. Category D expands the features of Category C by encouraging small group or team collaborations enroute to facilitating the students into building and participating in a learning community (Lameras et al., 2012). Hence, Categories C and D shift from a teacher-focused to a student-centred approach to teaching and learning with VLE. In line with the aspirations of 21st century teaching and learning whereby the emphasis is on student-centred approach to support the students' development into lifelong, active and independent learners as suggested by Scott (2015), thus utilisation of VLE should reflect the descriptions of either Category C or Category D.

2.3.3 Teachers As Digital Content Developers

According to Risquez et al. (2011), one of the most positive aspects of incorporating VLE for teaching and learning is that it enables access to online resources that facilitate student learning. Similarly, Radin Sili (2012) as cited by Md. Keling et al. (2013) mentioned that the plethora of educational materials

available nowadays via the internet and multimedia resources are beneficial in helping to improve and enrich teaching and learning experiences. However, it is crucial to ensure that the educational resources consist of quality materials that are suitable for teaching and learning based on among others the curriculum and assessments for the students.

Digital learning resources either in the forms of multimedia or cloud-based content used to be typically developed by organisations appointed by the MoE or outsourced to content development companies (Abdul Salam & Mansur, 2006). Teachers can be involved as pedagogical or subject-matter experts (SMEs) by the appointed organisations or companies, working collaboratively with technical experts in the development process of the digital learning resources (Kali, Markauskaite, Goodyear, & Ward, 2010). Such collaborative design efforts are ideal but can be challenging if the multi-disciplinary team members cannot effectively communicate with each other.

Previous studies cited by Kali et al. (2010) indicated that lack of integration between knowledge contributed by the team members could lead to either resources that were attractive but had low academic values, or ones that conformed to pedagogical requirements but were plain and uninspiring. Nonetheless, in their study, Kali et al. (2010) found that a careful selection of the multi-disciplinary team members, plus the availability of ICT tools that required less technological expertise could help to ensure a successful design solution, hence producing quality educational resources that were suitable for teaching and learning.

The emergence of cloud-based computing, the growing number of ICT tools that are user-friendly to non-programmers, as well as the emphasis on ICT integration in teaching and learning have expanded the roles of the teachers (Campbell, Al Hartini, & Karami, 2015). Nowadays they have progressed from merely executing the digital resources or becoming subject matter advisors, to a more active involvement as digital content designers and developers (Campbell, Al Hartini, et al., 2015; Kali, McKenney, & Sagy, 2015; Makri, Papanikolaou, Tsakiri, & Karkanis, 2014; Salvador et al., 2017). According to Salvador, Mariz, Fernandes and Santos (2017:573), the integration of new technologies in education, such as with VLEs, allows teachers and educators "to create and recreate learning materials based on a combination of interactive multimedia resources". This resonates with the classification of VLE for productive media as proposed by Laurillard (2005).

As highlighted in Chapter 1, teachers in Malaysia were encouraged to create interactive lesson or learning sites using their own Frog VLE account. The activity was part of the teachers' professional practice as the Frog VLE platform provided features for them to create the lesson or learning sites (Bahagian Teknologi Pendidikan, 2015; FrogAsia, 2016). Hence, the practice in Malaysia provides evidence of the teachers' professional contribution and for Laurillard's (2005) proposed use of the VLE as a productive media. Apart from that, when teachers progress from solely using the digital educational resources to a more advanced role of designing interactive learning or lesson sites, they also help to increase utilisation of the different features available on the Frog VLE platform.

Based on a study on teachers' roles as executor only, re-designer and co-designer of digital educational resources by Cviko, McKenney and Voogt (2014), it was revealed that teachers who became co-designers demonstrated the highest level of ICT integration in their teaching and learning, while the lowest ICT integration was shown by the teacher-executor only. It was suggested that when teachers were involved as co-designers, they gained better understanding of the curriculum as they scrutinised the details in order to produce educational resources that are in-line with the current curriculum. Thus, teachers who were co-designers also specified a high level of ownership and confidence with regard to the digital educational resources, hence the higher occurrence of ICT integration in their teaching and learning (Cviko et al., 2014). The finding undoubtedly corresponds with the Teacher ICT Integration model, whereby teachers who have a sense of ownership are at the more positive categories in the upper quadrants of either the CAs or SAs, most often making ICT integration as a common practice. Additionally, when teachers are involved as re-designers and co-designers, teaching and learning resources can be more tailored to suit their students. On the other hand, it is undeniable that some teachers can become less motivated to create or co-design digital contents because this changing role also indicates intensification of work, as referenced by Donnelly et al. (2011).

Nonetheless, in order to increase success in the implementation of ICT in education policy, it is still important to redefine the role of teachers for instance by encouraging them to be involved more actively as digital content designers or developers. This is because the possible reasons that lead to policy failure as highlighted in Section 2.1.4 can be avoided. Nevertheless, Bush, Abdul Hamid,

Ng and Kaparou (2018:1247) have cautioned that in a centralised hierarchical education system like in Malaysia, changing a certain practice including redefining the role of educational practitioners is challenging due to the “deeply embedded cultural expectations within a society where “power-distance” is accentuated”.

In addition, Kali et al. (2015) and Kirschner (2015) have hinted that research on teachers as digital content designers is still limited in number and depth of exploration. Yet, as the topic continues to receive significant attention, Kali et al. (2015) have suggested several areas for future research such as related to the knowledge that teachers have or need to enable them to design or re-design digital educational resources, the reasons leading them to be involved in the designing or re-designing of the resources, as well as the required support to ensure the design success. Since teachers in Malaysia are encouraged to create lesson or learning sites as part of their professional activities involving the VLE, this study has also explored the reasons that led them to participate in designing or re-designing contents on the VLE platform, as well as identifying the support that is deemed crucial in the design process.

2.4 SUMMARY

This chapter highlighted some findings from previous studies related to the impact of ICT on education. There were examples of the perceived advantages and disadvantages of technology integration in teaching and learning, both for the students as well as the teachers. It has been emphasised that when discussing the impact of ICT on education, there is a need to take into consideration other variables that may influence the research findings because

of the complexity that is associated with technology integration. Yet, despite the ongoing debates on the impact of ICT on education, Ministries of Education around the world are firm in deciding that educational technology will continue to be included in the education agenda. In line with the growing importance of ICT in the 21st century, there is also continuous emphasis on educational technology due to the desire to equip students with what is deemed necessary to prepare them to survive in life and excel as a future workforce for the country. These are evident from the ongoing investments, policies, blueprints and roadmaps of ICT in education. Furthermore, the incorporation of more up-to-date technology such as the VLE help to transform teaching and learning to be more ubiquitous, meaningful and learner-centred, with better access to educational resources for both the students and teachers.

With regard to teachers, this chapter has highlighted the importance of the teachers' role in the implementation of ICT in education initiatives. Teachers interpret and translate policies in action, as well as facilitate the use of the digital learning resources to optimise students' learning experiences. Introducing new ICT infrastructure and programmes often result in interference or change to the teachers' professional routine. Hence, educational policymakers, principals and heads of schools or academic institutions, programme managers and other related stakeholders need to understand factors that contribute to teachers' change in beliefs and attitude. As suggested by Clarke and Hollingsworth (2002: 947), the Interconnected Model of Teacher Professional Growth "offers a powerful framework to support the analyses of those studying teacher change…". The four domains described in the model provide some insights into the variables that contribute to the understanding of teachers' change in beliefs and attitudes.

In similar vein, the importance of teachers' beliefs is also evident in the Teacher ICT Integration model. Teachers' beliefs with regard to ICT integration is one of the criteria involved in classifying teachers into one of the four types specified in the model.

Meanwhile, the non-linear processes of 'enactment' and 'reflection' as represented in the Interconnected Model of Teacher Professional Growth indicate recognition of the complexity of teachers' professional growth and development. In this regard, the Teacher ICT Integration Model is akin to the Interconnected Model of Teacher Professional Growth whereby teachers are able to move from one quadrant of the category to another in a non-linear direction. Despite the complexity, it is still vital to get the buy-in from teachers, so as to increase successful implementation of educational policies and initiatives. By getting teachers to collaborate more actively in various academic processes such as in developing digital content, it will help to potentially enhance a sense of ownership of the digital resources by the teachers. It has been highlighted that embracing a sense of ownership is essential to consequently lead to positive teachers' educational beliefs.

As depicted by the Teacher ICT Integration model, having a sense of ownership or empowerment will contribute to a higher possibility of technology integration in teaching and learning. Nevertheless, in order to get to that stage, there is a need to conduct further investigations to understand the relationship between the teachers and technology integration. In the context of this study, it is vital to identify the driving force that motivates teachers to utilise the VLE initiative. In doing so, previous studies have suggested the significance of not only

understanding the processes leading to teachers' change in beliefs and attitudes, but also addressing the barriers that can hinder teachers from implementing the VLE. In addition, the Teacher ICT Integration model also contains useful descriptors that help to gauge the teachers' beliefs and standpoint in relation to ICT integration for teaching and learning. Data from the mapping between the teachers' standpoint and the model will be useful for relevant stakeholders to conduct appropriate activities aimed at increasing the technology integration.

Meanwhile, previous studies have also recommended TPACK as a framework to understand the impact of technology on teachers' professional practice. In relation to this study, effective technology integration is demonstrated when the teacher has the appropriate knowledge and skills to decide when and how to utilise VLE for teaching and learning. It is important for teachers to have this ability so that they can help students to explore and gain different learning experiences in order to develop the students' 21st century skills. Furthermore, the students will also be able to gain better understanding and access to knowledge as well as educational resources. In this regard, TPACK highlights the need for teachers' CPD courses to address the issue of how to integrate technology in education. Utilisation of VLE or other ICT in education initiatives has led to changes in expectations involving the teachers' classroom pedagogy and the teacher-student relationship. Thus, further inputs regarding the areas of investigations highlighted above will benefit policymakers and educational stakeholders in refining the current implementation strategies and practices, in order to facilitate optimum utilisation of the expensive VLE and other ICT in education initiatives.

CHAPTER 3: METHODOLOGY

3.0 INTRODUCTION

The aim of this chapter is to provide a methodological overview with regard to the implementation of this study. This chapter begins with a summary of the research background that has contributed to the focus for this study. An outline of the research questions is then presented followed by an elaboration of the research paradigm, ontology and epistemology that have influenced the methodological approach adopted by the researcher. Following this is a discussion of the research methodology, design and methods. This chapter also provides an elaboration of the instruments involved in this study, including the rationale for incorporating particular sections, statements or questions within the instruments. There are also individual sections presenting accounts of the pilot phase and actual study, before progressing to outline the approach to data analysis. Finally, this chapter also includes a discussion on areas of generalisability and validity in relation to this study.

3.1 RESEARCH BACKGROUND

In line with the vast development of ICT and the aim to increase access to education, the VLE is becoming a significant part of the teaching and learning process in the education sector (Awang et al., 2018; Cavus, 2013). The key advantage of incorporating a VLE in the teaching and learning process is its ability to enable access to education beyond the constraints of time and location (Cavus, 2013). In the Malaysian context, since 2012 teaching and learning in all national schools are supplemented with a cloud-based virtual learning platform (Ministry of Education Malaysia, 2013; Soon, 2014). At the time of data collection

for this study, the VLE platform deployed by the MoE to all the national schools in Malaysia was the Frog VLE.

This study was instigated by the fact that despite profuse amount of VLE-related programmes, the Malaysian government's national audit findings reported that usage of Frog VLE was only at 5% of the actual capacity (National Audit Department Malaysia, 2013). Subsequent studies such as by Md. Keling, Madar and Abd. Salam (2013), Junus (2013), Termit and Noorma (2015), Hiong and Umbit (2015) and Simin and Sani (2015) had captured and discussed the Malaysian teachers' readiness, attitudes and factors influencing the integration of Frog VLE in teaching and learning. Nonetheless, all of the studies were conducted based on quantitative methodology and without detailed exploration of the impact of the VLE implementation on teachers.

One recent study by Awang et al. (2018) was conducted using a mixed methodology involving a sequential explanatory design. Although the study was more in-depth compared to the other previous studies, its main focus was still related to examining the Malaysian teachers' intention to use Frog VLE, particularly teachers in four states in the Northern Region of Peninsular Malaysia. Therefore, besides adding to the current limited number of in-depth studies regarding the VLE implementation in Malaysia, this study also aims to investigate other areas such as the impact of the VLE utilisation on teachers. Furthermore, since the current VLE programme in Malaysia is a 15-year investment, more in-depth studies are necessary not only to contribute valuable information to improve the current implementation, but also to determine and influence the potential future of the initiative.

3.2 RESEARCH QUESTIONS

This study seeks to gain an in-depth understanding of the teachers' perspective regarding the utilisation of the VLE in the Malaysian post-primary national school context. In particular, this study aims to examine the extent and impact of the VLE utilisation amongst the teachers by addressing the following research questions:

3.2.1 What are the significant factors influencing the teachers' utilisation of the VLE platform?

3.2.2 How does the utilisation of the VLE platform affect the teachers' professional practice?

3.2.3 How does the integration of the VLE platform in teaching and learning affect the teacher-student relationship?

3.2.4 How do the teachers relate to the Teachers' ICT Integration Model and what are the implications for the utilisation of the VLE platform in post-primary national schools in Malaysia?

Hostager (2014) suggested that according to prior research, 'utilisation of online resources' refer to a range of different online behaviours by the users such as logins, accessing and engaging with online materials and participating in virtual discussions. Therefore, this study adopts a similar definition as to the one outlined by Hostager (2014). However, taking into account the functions of Frog VLE in the context of Malaysian national schools, the term 'utilisation' in this study is used to refer to the teachers' participation, engagement and time spent in using the VLE platform for professional practice. Teachers can utilise Frog VLE to search for educational resources and to develop learning sites that act as a repository for their own teaching and learning materials. Frog VLE can also be utilised to support activities during the teaching and learning process. Apart from

that, it can also be utilised to assign and receive submissions of homework from students or as a communication platform with the students, other teachers and the students' parents (FrogAsia, 2016; Ministry of Education Malaysia, 2013).

Meanwhile, literature suggests that 'impact' is closely associated with effects and outcomes. For example, Urquhart and Turner (2016:17) indicated that particularly in programme evaluations, "the outcomes may be short-term, medium-term or long-term but the term that often applies to the long-term outcomes is "impacts". Impacts may be positive or negative". Cornelissen et al. (2014) described 'impact' at group and individual levels as effects that included changes in knowledge, attitudes and practice. Similarly, Alammary, Sheard, and Carbone (2014) defined impacts as potential changes to existing programmes and experiences. Therefore, in relation to this study, the term 'impact' refers to the positive or negative outcomes associated with changes in knowledge, attitudes and practice as a result of having experience utilising the VLE platform.

As highlighted in Chapter 2, the Teacher ICT Integration model by Donnelly et al. (2011) was developed based on previous literature and studies on issues affecting teachers' use of educational technology, involving its potential benefits and barriers hindering the ICT integration. The categorisation of teachers as portrayed in the model was based on their educational beliefs, demonstration of TPACK and reasons for utilising technology in education (Donnelly et al., 2011; M. J. Koehler & Mishra, 2009). Hence, Research Question 1 was designed to examine and identify the potential benefits as well as barriers affecting the teachers from utilising the VLE platform. In addition, the Interconnected Model of Teacher Professional Growth by Clarke and Hollingsworth (2002) outlined the

process of teacher change. Apart from enhancing the significance of addressing Research Question 1 in this study, the Interconnected Model of Teacher Professional Growth was also influential in the formulation of Research Questions 2 and 3. Clarke and Hollingsworth (2002) suggested that teachers change as a result of reflections or observations of salient outcomes from their professional experimentations. Therefore, as this study aims to gain in-depth understanding of the teachers' perspectives regarding the utilisation of the VLE platform in teaching and learning, it is vital to examine the impact of the VLE integration firstly on the teachers' professional practice. Secondly, it is also important to understand the impact of the VLE integration on the teacher-student relationship because students are the direct recipients in teaching and learning sessions as well as the end receivers of most educational initiatives.

Finally, Donnelly et al. (2011) also suggested that the classification of teachers based on the Teacher ICT Integration model is beneficial for policymakers and other stakeholders in developing strategies to increase the utilisation of ICT initiatives. It has been highlighted that apart from the lack of in-depth previous studies regarding the utilisation of a VLE platform in Malaysia, this study was also instigated by the reported underutilisation of the VLE platform as highlighted via the government's national audit findings and several subsequent academic studies. Thus, Research Question 4 was formulated to group the Malaysian teachers according to the classifications portrayed in the Teacher ICT integration model. The mapping of the Malaysian teachers based on the model is beneficial to suggest strategies for further improvements with regard to the teachers' VLE utilisation for teaching and learning.

3.3 RESEARCH PARADIGM

Literature on social research methods often includes a description of research paradigm in the earlier stage of the research process. A research paradigm refers to a researcher's way of "understanding reality, building knowledge, and gathering information about the world" (Tracy, 2013:38). Different authors discussing social research methods have used different terms to refer to the same research paradigm as defined by Tracy (2013). For instance, while Cohen, Manion and Morrison (2011) and Atkins and Wallace (2012) also use the term 'paradigm', other authors such as Crotty (1998) prefers the phrase 'theoretical perspective', Check and Schutt (2012) label it as a 'research philosophy' and Creswell (2014) describes it as a 'philosophical worldview'.

An investigation into the literature reveals several categories of philosophical worldviews, research philosophy, theoretical perspectives, or hereafter in this study referred to as research paradigms, some bearing different labels to refer to similar descriptions. Among the different research paradigms are positivism (and post-positivism), interpretivism, critical inquiry and pragmatism (Cohen et al., 2011a; Creswell, 2014; Tracy, 2013). A brief overview of the above-mentioned paradigms are listed below, in which they are derived from descriptions by Atkins and Wallace (2012), Baxter and Jack (2008), Check and Schutt (2012), Creswell (2014), Crotty (1998), Guba and Lincoln (1994) and Tracy (2013).

Positivism and *post-positivism* believe in objective reality that may be understood through empirical research, usually associated with quantitative studies that aim to seek answers for cause and effect relationships of certain phenomena or

testing replicated findings that are possibly true but may also be “subject to falsification” (Guba & Lincoln, 1994:110).

Interpretivism deals with the belief that meanings and reality are socially constructed based on individual experience, communication, practice as well as interactions with other people. This situation leads to multiple and complex views as different individuals may have varying opinions, understanding and beliefs. Thus, the goal of educational research is to understand these differences, as it is important to examine “the world from participants’ points of view” (Tracy, 2013:41).

Critical inquiry emphasises the importance of including political agenda and power relations when discussing social issues. Hence, authors such as Tracy (2013), Cohen et al. (2011), Guba and Lincoln (1994) and Creswell (2014) include feminist perspectives in this type of paradigm whereas Crotty (1998) prefers to view feminism as a separate research paradigm.

Pragmatism is a paradigm that places emphasis on practicality, the need to find solutions to problems and is based on the understanding that “there may be both singular and multiple versions of truth and reality, sometimes subjective and sometimes objective, sometimes scientific and sometimes humanistic” (Cohen et al., 2011:59).

3.3.1 Ontology and Epistemological Perspective

Literature has also suggested that a researcher's choice of paradigm is closely linked to other factors such as his or her ontological and epistemological assumptions (Cohen et al., 2011a; Tracy, 2013). According to Crotty (1998:10) ontology which is referring to "the study of being", is often associated with the understanding of "what is" the nature of reality. Meanwhile, epistemology is defined as "the nature of knowledge" (Tracy, 2013:38). In the words of Crotty (1998:8) epistemology involves "how we know what we know". Since the main focus of this study evolves around the utilisation of the VLE platform among teachers in Malaysian post-primary national schools, the researcher believes that reality tends to be relative or subject to the individual teacher. It may be derived from the teacher's beliefs based on multiple factors such as knowledge and experience as he or she begins to utilise the VLE in his or her local setting. The ontological assumption is adopted from Guba and Lincoln (1994:110) who described a relativist as follows;

> "Realities are apprehendable in the form of multiple, intangible mental constructions, socially and experientially based, local and specific in nature (although elements are often shared among many individuals and even across cultures), and dependent for their form and content on the individual persons or groups holding the constructions".

It is probably worth highlighting that in this relativist ontological belief, it places emphasis on being "more or less informed and/or sophisticated" instead of being 'true' or 'false' (Guba & Lincoln, 1994:111). Thus, constructions of meanings may evolve and are flexible while reality may change as the individual becomes more informed and sophisticated. In relation to this study, and with reference to the types of teachers as depicted in the Teacher ICT Integration model (described in Chapter 2), a CT has decided not to use the VLE in his or her teaching practice

due to several possible reasons such as unfamiliarity, lack of knowledge, as well as fear of technology.

However, the scenario may be different for another teacher in the same school who is in the category of an IU. Despite not being technology savvy, the IU is willing to learn how to use the VLE and after some practice, has become an active and confident VLE user in the school. Meanwhile, the CT who is aware of the IU's progress, begins to receive exposure on the VLE as part of the school's initiative. After the exposure and several subsequent VLE sessions, the CT becomes more informed of the benefits and disadvantages of the VLE, and depending on the CT's current belief, he or she may now decide to either join the IU's bandwagon and start utilising the VLE or remain with the decision to leave out the VLE in the teaching practice.

The ontological assumption that reality is relative to the social actors (teachers in the case of this study), points closely to the epistemology of a constructivist nature because as indicated by Crotty (1998:9), in the understanding of knowledge from a constructivist point of view, "different people may construct meaning in different ways, even in relation to the same phenomenon". It is believed that people develop or *construct* meanings as they engage with or experience the phenomenon they are interpreting (Crotty, 1998; Guba & Lincoln, 1994). Again, there is a slight variation in the terminology used by different authors when discussing this particular epistemological assumption. Several authors such as Baxter and Jack (2008), Check and Schutt (2012), Creswell (2014), Guba and Lincoln (1994) and Tracy (2013) unanimously use the term constructivism, with Tracy (2013) acknowledging that constructivism is

sometimes referred to as constructionism. Nonetheless, Crotty (1998) suggests that there is a distinction between constructivism and constructionism. According to Crotty (1998:58), constructivism relates to the "unique experience" of individuals, in which "one's way of making sense of the world is as valid and worthy of respect as any other".

On the other hand, it is recommended that constructionism is used when referring to groups of people, such as the society, where "the focus includes the collective generation and transmission of meaning", thereby often associated with the phrase 'social constructionism' (Crotty, 1998: 58). Since the central feature of both constructivism and constructionism is to acknowledge that meaning making is developed as people relate to the object or phenomenon, this study will therefore opt for the term constructivism, regardless of whether the process is done individually or as a group of society.

Constructivism is also associated with the idea of intentionality, referring to the sense of 'moving towards' or 'directing oneself to', as described by Crotty (1998:44):

> "When the mind becomes conscious of something, when it 'knows' something, it reaches out to, and into, that object…intentionality posits a quite intimate and very active relationship between the conscious subject and the object of the subject's consciousness".

Perhaps the example between the CT and IU as illustrated earlier is an applicable portrayal of what is meant by Crotty (1998) via the description in the above-mentioned quotation. Both the CT and the IU progressed from not knowing about the VLE, to becoming familiar with it through active engagement and practice

sessions. It is very likely that both teachers, particularly the IU, were very conscious and clear of the possible advantages, and perhaps disadvantages of the VLE plaform, to the extent that he or she finally decided to utilise the VLE in teaching and learning.

3.3.2 Research Paradigm for This Study

Taking into account that the participants' viewpoints are relative and may vary according to individuals, this study therefore takes its approach from the research paradigm of interpretivism. It aims to examine the participants' experiences, opinions as well as the essence of their meaning making processes with regard to utilisation of the VLE. Tracy (2013) and Crotty (1998) mentioned that interpretivism stemmed from the concept of 'verstehen', a German word that means 'to understand'. Max Weber (1864 – 1920) who was very closely associated with the development of verstehen in sociology, believed that "sociology should be rooted in a systematic understanding of the subjective meanings that individuals place on their actions, and that these individual-level understandings could in turn help explain social structures and historical change" (Walker, 2013:2).

According to Tracy (2013:41), verstehen (which aims to support a holistic understanding of a particular phenomenon), is often associated with an analysis of "the first-person perspective that participants have on their personal experience as well as on their society, culture, and history". Therefore, research based on interpretivism highlights the array of multiple contexts that possibly contribute to the participants' points of view. For that reason, it is important for the researcher to carefully select a specific research methodology that will

capture the differing views of the participants and subsequently help to disentangle and understand the issue under investigation.

3.4 RESEARCH METHODOLOGY AND DESIGN

Although there is neither a fixed set of justifications nor exact formula as to which methodology and methods to employ for a study, literature has suggested that the researcher takes into consideration several factors such as the research questions and research paradigm for the study (Atkins & Wallace, 2012; Creswell, 2014; Yin, 2009). As outlined in Section 3.2, the research questions in this study evolve around teachers' motivation and standpoint regarding the utilisation of the VLE platform in the Malaysian post-primary national school context as well as the impact of the VLE implementation on the teachers. Meanwhile as described in the previous section, this study is based on the interpretivist research paradigm, having been influenced by the constructivist epistemology and the belief that reality is relative to the social actors, and the contexts in which they interact. In line with the concept of 'verstehen' which emphasises on gaining an in-depth understanding of a phenomena based on diverse inputs from individuals, this study therefore involves multiple-site case study because as mentioned by (Yin, 2009:4), "… the distinctive need for case studies arises out of the desire to understand complex social phenomena. In brief, the case study method allows investigators to retain the holistic and meaningful characteristics of real-life events…".

There are three important features of a case study that may be accentuated in the statement by Yin (2009). The first one involves the need *to understand complex social phenomena* and the second highlights the notion of a *holistic*

study. Both features have been mentioned in Section 3.3 (Research Paradigm) and also in connection with the concept of verstehen. The other implication based on the statement is that it allows the researcher to study *meaningful characteristics* of *real-life events* or conduct the research in the natural social setting. To reiterate the features, Simons (2009:16) stated that case studies "focus on documenting complexity, interpreting in context, observing in natural social conditions and communicating in the natural language of participants". In addition to that, Atkins and Wallace (2012:108) specified that case studies "provide a means for the researcher to capture or interrogate the 'real world' – be that a situation, an organisation or a set of relationships – in all its complexity, in a way that quantitative approaches cannot do".

For example, a quantitative study adopting the survey method may use, although not necessarily in every situation, a questionnaire that has been developed based on a set of predetermined variables and closed-ended questions (Check & Schutt, 2012; Cohen et al., 2011a; Saris & Gallhofer, 2014). Thus, the researcher in this situation plays a dominant role in deciding the variables to be included in the questionnaire while the participants may have little or no room to express their opinion beyond the nature of the closed-ended questions. Meanwhile, although experimentation studies may be conducted in a natural field setting, they typically involve some form of intervention so as to control the important variables (Gomm, Hammersley, & Foster, 2000). This is in contrast to the scenario in case studies, where the researcher has no control over the actual behaviour of the participants or the case that is under investigation (Gomm et al., 2000; Yin, 2009). Thus, this lack of control over the actual behaviour of the participants make case

studies as the preferred option to examine the unique criteria and motivation for individuals' actions held in the context of their natural setting.

3.4.1 The Multiple-site Case Study

As specified earlier, this research adopts a multiple-site case study or hereinafter referred to as multiple-case study design. Case studies may be categorised as either a single-case or a multiple-case design (Baxter & Jack, 2008; Yin, 2009). A single-case study occurs for instance when only one particular school is chosen in which to study the teachers' utilisation of the VLE. According to Baxter and Jack (2008) and Yin (2009), the single-case study focuses on the uniqueness or extreme condition of the case. There are two types of single-case studies, namely a holistic single-case study and a holistic single-case study with embedded units (Baxter & Jack, 2008; Yin, 2009). A holistic single-case study is when a researcher only samples one environment, such as School A, that matches the research criteria for instance for being acknowledged as the only school in the entire district or nation to incorporate the VLE in teaching and learning. Meanwhile, if the researcher decides to conduct an analysis of the same issue but taking into consideration how teachers from different academic units or departments within School A utilise the VLE, it becomes an example of a holistic single-case study with embedded units (Baxter & Jack, 2008; R. K. Yin, 2009).

In contrast, a multiple-case study emphasises different contexts or environments for each case, whereby the researcher has the opportunity to analyse "within each setting and across settings" (Baxter & Jack, 2008:550). In addition, Baxter and Jack (2008) and Yin (2009) have indicated that although multiple-case studies may be more time consuming and expensive than a single-case study,

the evidence from different cases make the study more interesting, robust and reliable. The VLE implementation in the context of Malaysian national schools is a nationwide deployment, yet the areas of teachers' utilisation and impact of the VLE are still lacking in terms of in-depth exploration. Hence, conducting a multiple-case for this study is seen as fitting because of the potential availability of the schools to be selected as cases, and more importantly for the opportunity to involve, explore, compare and contrast the perspectives of teachers in their respective cases, both within the same as well as in different schools.

3.4.2 Research Methods

A multiple-case study design involves data collection methods that are replicated from one case to the others (Yin, 2009). Data collection methods for a qualitative case study may take a number of methods yet according to Simons (2009), the most commonly used case study methods are interviews, observation and document analysis. This study utilised interviews, classroom observations and a survey within the case study in an attempt to get a complete understanding of the topic regarding teachers' utilisation of the VLE platform.

(a) Interviews

In this study, interviews were the primary method of data collection because according to Lindlof and Taylor (2011) as cited by (Tracy, 2013:132);

> "Through interviews, the respondents can provide their opinion, motivation, and experiences. They may tell stories and narratives… Such stories frame the way participants understand the world, delimiting opportunities and constraints for action. Through interviews, participants can provide accounts – or rationales, explanations, and justifications for their actions and opinions. Interviewees can reveal their specific vocabulary and language and explain why they employ certain clichés, jargon, or slang".

Eliciting responses from the teachers in their own words, with regard to their opinion, motivation, experience and possibly highlights of specific incidents whilst utilising VLE for their professional practice was considered by the researcher as appropriate to gleaning the information to answer the research questions. As an added value to the advantage of garnering better in-depth insights from each individual participant, interviews are also more flexible than the fixed questions in quantitative surveys. Although there is an interview schedule or protocol which serves as an outline of the main topics related to the research questions, the researcher may still slightly rephrase the questions or rearrange the order in which they are asked to the participants (King & Horrocks, 2010). The flexibility of an interview is important to create an opportunity for active dialogue as well as to allow the participants to contribute in a way they feel appropriate for the research (Atkins & Wallace, 2012; Simons, 2009).

(b) Classroom Observations

Apart from interviews, this study also included classroom observations as part of the research methods. Simons (2009:55) suggested that conducting an observation is a good companion method to interview in a case study because the researcher can gain “a comprehensive picture of the site” which may not be easily captured solely by listening to people’s accounts. Apart from that, observations may also provide rich descriptions for analysis and interpretation. Another important reason for conducting observations is that they “provide a cross-check on data obtained in interviews” (Simons, 2009:55). Indeed, this study has included the method of classroom observation to firstly substantiate data gathered from the interviews and survey. Furthermore, the classroom

observations also helped the researcher to identify potential salient details related to the research.

Meanwhile, when conducting an observation, Check and Schutt (2012) described that the researcher needs to decide whether to choose the role as an overt observer (does not participate in group activities but is publicly defined as a researcher) or a covert observer (not participating in the social interaction and without disclosing the identity as a researcher to the participants). Another role includes an overt participant or sometimes known as a participant observer who not only publicly acknowledges herself or himself as a researcher but also takes part in the group activities. The last type is a covert participant in which the researcher joins the group activities without informing the other members of the research role (Check & Schutt, 2012). Roulet, Gill, Stenger and Gill (2017) highlighted that covert observation and participation have been challenged as unethical because they involve a sense of deception. In this study, the researcher was an overt observer, choosing to let the students and obviously the teachers know of the presence as a researcher, yet not taking part in any of the class activities. Check and Schutt (2012) and Choy (2012) argued that if a researcher decides to be an overt observer, his or her presence may likely alter the situation being observed. In other words, the particular lesson could have been staged for the purpose of the observation. Hence, it means that the lesson may lack authenticity and as a result will probably disrupt the interpretation and analysis of a 'comprehensive picture of the site' or regarding activities conducted in a lesson in the 'real world'. In order to overcome this issue, Choy (2012) suggested that interviews or discussions should be made as a means of corroboration of the data gathered via the classroom observations. Taking the argument and

suggestion as valid and important, this study had included group interviews conducted with several students either after the classroom observation or generally in relation to lessons that involved the utilisation of Frog VLE.

(c) Survey

This study had also incorporated a survey within the multiple-case research design. Due to the large number of teachers and post-primary national schools in Malaysia, which will be detailed later in Section 3.7, it was not possible to invite many teachers to take part in the interview and classroom observation sessions, within the constraint of time and manpower for this study. While the main target is not about achieving representativeness or generalisation, which will also be discussed later in Section 3.9, including a survey within this multiple-case study was aimed at trying to gauge the opinion regarding Frog VLE utilisation from other teachers who were not involved in the interview sessions. Besides that, information gathered from the survey serves as additional data for the researcher to pursue the concept of verstehen as described earlier in Section 3.3.2.

3.5 INSTRUMENTS

Three types of instruments were used in this study, namely a questionnaire, interview schedules and classroom observation sheet, each of which is described below.

3.5.1 Questionnaire

The survey involved an online questionnaire using the Google Forms platform (see Appendix 1). It was initially planned to be fully administered via online to teachers in the case study schools. However, the researcher discovered at the pilot stage that conducting the online survey generated a very poor response,

thus an alternative means of questionnaire distribution was included during the actual study. Further elaborations regarding the questionnaire will be detailed in Section 3.6 and Section 3.7. The questionnaire was developed based on instruments from previous studies related to Malaysian teachers' utilisation of the VLE as well as input derived from the MoE Malaysia's Guidelines for the Development of Learning Sites for Teaching and Learning. In particular, several items were adapted from previous studies regarding Frog VLE conducted by Md. Keling et al. (2013) and Junus (2013) involving Malaysian teachers.

This questionnaire comprised of fifty six items that were categorised into seven sections consisting of sentences that Saris and Gallhofer (2014:32) refer to as "requests for answers". According to Saris and Gallhofer (2014), sentences that are used to elicit responses from the respondents, yet not in the interrogative form are referred to as requests for answers and not as questions. Items in the questionnaire had been revised based on responses and feedback during the pilot stage, as well as taking into consideration some updates in the literature review. Apart from that, the questionnaire originally contained items solely in the format of categorical variables. Nonetheless, some items in the questionnaire were adjusted after the pilot stage so that the coding scheme would enable responses that could be classified as continuous data. This was to allow the possibility of using both descriptive and inferential statistical analyses. With the exception of Section 1: Background and Consent, the following paragraphs will describe the rationale for including each section in the questionnaire for this study. The following descriptions for each section are based on the final version of the questionnaire that was used for the actual study.

Section 2: Demographic information

This section contained requests for teachers' feedback on several categories including the types of schools they were teaching, gender, age, approximate years of teaching experience as well as in the use of Frog VLE, and the subjects the teachers were teaching. This section is relevant to determine whether demographic factors contribute to the teachers' decisions to utilise the VLE, in each of the case study schools.

Section 3: Actual Utilisation of Frog VLE

Statements in this section were developed based on the main functions of the VLE in the context of national schools in Malaysia, as indicated in official documents released by the MoE, such as the MEB 2013-2025 as well as adapted from previous studies by Md. Keling et al. (2013) and Junus (2013). This section contained seven statements that were intended to examine the extent of teachers' actual Frog VLE utilisation. For instance, teachers were asked to refer to any one particular class that they were teaching and indicate the approximate number of times in which integration of Frog VLE was used with the students. Indeed, the number of assigned classes varied in practice from one teacher to another. According to OECD's report on Teaching and Learning International Survey (TALIS) for the year 2013, teachers in Malaysia were reported to be teaching an average of 17 hours per week (OECD, 2016). Hence, the teachers' indications regarding the number of times they integrated Frog VLE for teaching and learning with one particular class were then calculated based on the TALIS average to gain a broader perspective of the extent of their Frog VLE utilisation. Further elaboration regarding the extent of actual Frog VLE utilisation will be discussed later in Section 3.8.1 as well as in Chapter 4.

In addition, statements such as “I assign homework to students via Frog VLE”, “I utilise Frog VLE to give feedback to my students regarding their homework or assignments” and “I utilise Frog VLE to communicate with the students’ parents” was also intended to gauge the extent of Frog VLE utilisation as well as to depict some of the available functions of the platform. Units of measurement that indicated time or extent of use such as “once a week”, “once a month”, “never”, “often” and “always” were used to frame the teachers’ responses for statements in this section.

Section 4: Frog VLE Integration, Teachers’ Beliefs and Reflection

Statements in Section 4 focused on eliciting responses to gauge the teachers’ beliefs with regard to Frog VLE utilisation in particular, but would also provide a reflection of their attitude towards ICT integration in teaching and learning in general. A five-point Likert scale between 1 to 5 in which scale 1 represented ‘Strongly Disagree’ and scale 5 referred to ‘Strongly Agree’ was used to record answers for the statements. The statements in this section were mostly constructed based on the Teacher ICT Integration model which was developed by Donnelly, McGarr and O’Reilly (2011). For example, teachers who recorded the higher options (between scales 4 to 5) for the statement “I integrate Frog VLE in teaching and learning whenever I find useful resources that will help my students improve their academic grades” may suggest that they are SAs based on the Teacher ICT Integration model. Meanwhile, teachers who answered either number 4 or 5 from the Likert scale options for the statement “I use Frog VLE because other teachers are using it” may suggest teachers who are IUs.

The development of statements in Section 4 also took into consideration input from the Interconnected Model of Teacher Professional Growth by Clarke and Hollingsworth (2002). As elaborated in Chapter 2, the model highlights four domains that contribute to teachers' change environment. Clarke and Hollingsworth (2002) have also emphasised the importance of self-reflection in enhancing the teachers' beliefs and change environment towards their professional growth. Therefore, statements such as "I am more motivated to utilise Frog VLE for teaching and learning if there is encouragement from the school administrator", "I am more motivated to utilise Frog VLE for teaching and learning after I have seen evidence of positive outcomes from using it" and "I realise that interactions and communications between my students and I have increased since I started utilising Frog VLE with them" were representations of the elements depicted in the Interconnected Model of Teacher Professional Growth. The teachers' responses for these statements (also in Likert scale format), provided valuable information for the researcher in trying to understand the motivating factors that potentially influenced the teachers' beliefs and decisions regarding Frog VLE utilisation.

Section 5: Development of Learning Sites

Items included in this section were constructed based on literature review and information from the Guidelines for the Development of Learning Sites for Teaching and Learning (Bahagian Teknologi Pendidikan, 2015). In general, items in Section 5 were aimed at analysing the extent of the teachers' involvement in developing learning sites in Frog VLE. For instance, the options of '0', 'Between 1 to 10' and 'More than 10' associated with the choices to answer the statement "I have developed the following number of learning sites in Frog VLE" helped to

portray the extent of the teachers' active (or inactive) involvement as developers of the learning sites. The numbers included in the options for the statements were made in consultation with relevant officers in the Educational Technology Division, MoE.

This section also included an item requiring the teachers to self-evaluate themselves with regard to their skill level in terms of developing learning sites. The teachers were asked to respond to the statement "I consider myself at the following skill level in terms of developing learning sites". The teachers' responses from the options available, namely 'No skill at all', 'Low level', 'Intermediate level' or 'Advanced level' provided potential reasons for their extent of involvement in developing the learning sites. Another statement in this section was aimed at identifying the types of widgets in Frog VLE that were commonly utilised by the teachers. Apart from that, there were also statements to explore the teachers' opinion and attitude in relation to their participations in learning sites development. This is in line with the need to have more studies that gauge teachers' motivation to engage themselves as designers of technology enhanced lessons (Kali, McKenney, & Sagy, 2015). In this case, options were included with the statement "I develop learning sites in Frog VLE because of the following reasons". The options given were for instance "to diversify my teaching and learning approaches", "for my own future reference" and "for my students' independent learning".

Section 6: Frog VLE Training and Teachers' Professional Development

Previous studies indicated that lack of relevant training and CPDs were among the barriers that hindered teachers from integrating the VLE or ICT in teaching

and learning (Albugami & Ahmed, 2015; Rabah, 2015; Raman & Yamat, 2014). The literature review chapter has also included a discussion on the importance of addressing *how* to integrate ICT in education. Thus, Section 6 of this questionnaire was specifically dedicated to draw responses regarding teachers' CPD activities and whether the sessions have enabled the teachers to develop their skills and confidence on how to utilise Frog VLE. Examples of the statements included "I have received adequate training or professional development sessions on how to integrate Frog VLE for teaching and learning", "I have received adequate training or professional development sessions on how to develop learning sites for Frog VLE" and "The training or professional development sessions I have received enabled me to confidently utilise Frog VLE".

Section 7: Challenges/Barriers to Integration of Frog VLE

This section contained a combination of statements that were adapted from the study by Md. Keling et al. (2013) as well as input from literature reviews on barriers to the VLE or ICT integration, other than on training and CPDs which had been addressed in Section 6 of the survey questionnaire. The statements in this section included associations to first order barriers such as in the following statements; "The number of functioning ICT equipment in the school is adequate to implement teaching and learning that integrates Frog VLE", "Majority of my students have suitable ICT equipment and internet connectivity to access Frog VLE outside the school" and "I am able to allocate enough time to prepare for a lesson that integrates Frog VLE". There were also statements that were designed based on second order barriers such as in the statements "Frog VLE can be used to support the curriculum and subject syllabus" and "Frog VLE can be used to

support students' preparations for assessments or examinations". Finally, this section also contained some blank spaces for teachers to insert additional comments or recommendations regarding issues that possibly had not been covered throughout this survey questionnaire.

3.5.2 Interview Schedules

There were originally three semi-structured interview schedules prepared for this study. The three schedules were used as outline framework for the interviews with teachers, school administrators and students (see Appendices 2, 3 and 4). Nonetheless, towards the final phase of conducting the actual study, another semi-structured interview schedule was added and used for the interview with a policymaker in the MoE (see Appendix 5). A detailed elaboration of the rationale for adding this interview is included in Section 3.6.2. As the main focus of this study is investigating teachers' utilisation of the VLE platform, the interview schedule for the teachers contained questions covering eight main topics, each detailed into several follow-up questions that were used to further prompt the teachers, depending on their initial responses. All questions in the interview schedule only served as a framework, thus the order in which they were asked to the participants was tentative, and slight paraphrasing of the question structure also occurred during the interview process. This was in line with a typical proceeding of a semi-structured interview as highlighted by King and Horrocks (2010). Below is a brief overview of the focus of each question in the interview schedule.

(a) Teacher Interview Schedule

Question 1 began by asking whether the lesson observed was an example of the teacher's typical lesson with Frog VLE integration. This was to explore several themes such as the suitability of Frog VLE integration with subject areas, the teachers' rationale or purpose for integrating Frog VLE in teaching and learning and factors taken into consideration when the teachers designed lessons that integrate Frog VLE.

Question 2 focused on the teachers' opinion regarding the potential benefits and drawbacks of using Frog VLE for the students. Here, depending on responses, the researcher probed the teachers' belief regarding the association between Frog VLE utilisation and students' academic grades, examinations, 21st century teaching and learning and the development of students' higher order thinking skills.

Question 3 dealt with the potential benefits and drawbacks of Frog VLE for the teachers. The scope of areas that were explored here included the impact of Frog VLE on the teachers' professional practice such as transformation in teaching pedagogy, effect on preparation and delivery of lessons, as well as on possible changes to the teacher-student relationship.

Question 4 investigated the teachers' opinion concerning significant factors that might have promoted or impeded the utilisation of Frog VLE among teachers in general. The sub-question provided room for the researcher to also inquire for the reasons leading the teachers to form that belief or opinion.

Question 5 addressed the challenges that teachers have experienced when utilising Frog VLE. Here, the questions provided cues for discussions on issues concerning time, technological problems and different expectations including from self, school management and colleagues. In addition, where relevant, prompts were also given to identify how the teachers overcame the challenges and difficulties identified.

Question 6 shifted focus specifically onto the teachers' possible role as content developers. As highlighted in Chapter 2, teachers in Malaysia were highly encouraged to develop learning sites for their own use as well as to share with their colleagues using their school's Frog VLE and with other teachers via the MoE Frog VLE repository (Bahagian Teknologi Pendidikan, 2015; Ministry of Education Malaysia, 2013). Thus, through Question 6, the researcher attempted to elicit whether or not the teachers were regular contributors, the reasons and motivations for being (or not being) regular contributors, and to share or highlight specific experiences in relation to developing learning sites in Frog VLE.

Question 7 was aimed at exploring the extent of Frog VLE utilisation in the school, based on the teachers' experience and observation. It included probing on areas such as evidence of Frog VLE utilisation and culture among the school community as well as efforts and supports from the school administrator with regard to the utilisation of Frog VLE.

Question 8 focused on CPD sessions related to Frog VLE that the teachers have experienced. Responses from the teachers are valuable to identify whether the sessions address the concern of *how* to integrate Frog VLE in teaching and

learning, and to examine issues such as their effectiveness in producing the intended output and outcome for the teachers, as well as the overall impact of the continuing professional development experience.

(b) School Administrator Interview Schedule

The interview schedule for the school administrator (either the Principal or one of the senior assistants) was aimed at providing a broader perspective on Frog VLE utilisation in the context of implementation in the particular case study school. Questions in the interview were designed to explore key issues about Frog VLE utilisation from the point of view of a school administrator. For example, there were questions that addressed the general benefits and shortcomings of Frog VLE for teachers and students in the particular school, teachers' involvement as content developers and activities that had been organised to encourage the school community to utilise Frog VLE.

There were also questions that aimed to uncover the challenges faced when trying to ensure utilisation of Frog VLE in the particular school. The questions were both related to first order barriers such as ICT infrastructure, budget, teachers' skills and opportunity for continuing professional development, as well as those pertaining to second order barriers such as the teachers' beliefs and suitability of Frog VLE in relation to the current curriculum and assessment. In an attempt to explore the impact of Frog VLE utilisation, the school administrator was also asked to address questions focusing on the changes observed in teachers' teaching approach as well as students' attitude and learning styles.

(c) Student Group Interview Schedule

As outlined in Section 3.4.2 (b), this study also included interview sessions with the students, mainly to corroborate the data gathered during the classroom observation. In order to determine the authenticity of the lessons observed, students were asked if other lessons that included integration of Frog VLE were in fact similar or different to the one witnessed by the researcher. At the same time, the student group interview schedule was also designed to take account of the students' voice and opinion with regard to the integration of the VLE for teaching and learning. For instance, some questions were also prepared to identify common issues faced by the students while using Frog VLE, including concerns about access to the virtual platform within and outside the school compound, their ICT skills and familiarity with Frog VLE. Apart from that, the students were also requested to share their opinion and experience regarding the use of Frog VLE as part of their teaching and learning experience.

3.5.3 Classroom Observation Sheet

The classroom observation sheet contained five categories of items for observation, namely the teacher and teaching style, classroom instruction or activities, student behaviour, classroom culture and VLE integration (see Appendix 6). Each category included several indicators or descriptors that contained reference codes as guides for the researcher during the observation. For example, in Category A: Teacher and teaching style, among the indicators were "A1: teacher acts as a facilitator/mediates activity", "A2: teacher uses teacher talk" and "A8: there is evidence that the teacher answers the students' questions either via face-to-face or through Frog VLE". Meanwhile, in Category C: Student Behaviour, some of the indicators were for instance "C1: students

show interest in lesson (such as via body language and facial expressions)", "C2: active participation from majority" and "C4: there is evidence that students ask appropriate questions related to the lesson either via face-to-face or through Frog VLE". In Category E: VLE Integration, the indicators referred to the purpose for incorporating Frog VLE in the lesson such as "E1: to support teacher's explanation", "E2: as the main activity/task for the students during lesson in class" or "E4: for communication/discussion outside class hours". Using the indicators and reference codes, the researcher created short notes to reflect particular observation or evidence, related to the activities and behaviour occurring in the classroom during the teaching and learning that included utilisation of Frog VLE.

3.6 PILOT STAGE

The pilot stage of this study was conducted in February 2017 at one post-primary national school located in the state of Johor, Malaysia. The school was selected because it was in the list of top ten schools that were actively using Frog VLE in Johor. The information was obtained from the Educational Technology Division of the MoE Malaysia, one of the authorities that monitored the utilisation of Frog VLE in all national schools in the country. Due to the regulation and procedure for conducting research in Malaysia, approvals were gained firstly from the Economic Planning Unit (EPU) of the Malaysian Prime Minister's Department on 23rd January 2017. The EPU acts as the central authority that manages all studies in the country that are administered either by foreign nationalities or Malaysians attached to foreign institutions.

The approval from the EPU was compulsory in an effort to ensure that the studies are beneficial for the nation, issues that may be sensitive to the locals are dealt

with appropriately and the researchers adhere to any further regulations and procedures related to the handling of research materials (Prime Minister's Department, 1999). After gaining permission from the EPU, another layer of application was sent to the Johor State Education Department. The approval from this department was obtained on 26th January 2017. The two approvals were additional to the University ethics approval that was subsequently obtained on 30th January 2017. It was mandatory as part of the research ethics that the researcher must inform all participants among others regarding confidentiality and anonymity of their participations in the study. The ethics information and informed consent from the participants were obtained via relevant forms (see Appendices 7 to 10).

For the purpose of the pilot study, there were three visits made by the researcher to the school. The first visit involved a meeting with the school Principal to establish contact and to provide a briefing about the study. During this stage, all consent forms related to the study were given to the school Principal who then liaised with the relevant potential participants. During the second visit, the researcher was introduced to the three teachers who were going to take part in the pilot study, as well as the schools' IT Coordinator. The link for the online survey was given to the IT Coordinator to be placed in the school's Frog VLE platform for all teachers to access and participate. In the meantime, based on pre-determined teacher selection criteria, the Principal and Senior Assistant in-charge of academic affairs appointed the three teachers for the case study approach. The teacher participants for this pilot stage were a male teacher teaching Geography and two female teachers teaching Science and Islamic Studies respectively. The interview with the school administrator was conducted

with the Principal on the second visit to the school. Meanwhile, pilot data collections involving two of the teachers (for Geography and Science subjects) were also completed during the second visit. The pilot data collections included interview sessions with the teachers and their selected students as well as classroom observations. The students were selected on a voluntary basis. Meanwhile, the pilot stage involving the Islamic Studies teacher and her students had to be conducted on a different day to suit the subject timetable.

In general, pilot testing was successfully conducted for the case study approach in which significant responses were elicited from the participants (Principal, teachers and students) using the interview schedules. Based on informal feedback from the participants, the questions asked to them were easily understood and covered most pertinent issues regarding the implementation of Frog VLE. Nonetheless, one teacher suggested that different age groups should be included as part of the teacher selection criteria, in addition to the other two teacher selection criteria namely being an active user of Frog VLE and teaching any of the Lower Secondary subjects. The suggestion to include different age groups as an additional criterion is seen as necessary to ensure teachers from various age groups and possibly years of teaching experience are represented, thus providing data for the case study to analyse whether age groups and years of teaching experience affect the teachers' utilisation of Frog VLE.

The situation was however different with the pilot data collection for the online survey. After two weeks of having the survey on the school's Frog VLE, only two responses were recorded. The IT Coordinator was verbally informed regarding the situation and requested to help encourage the teachers in the school to

participate in the online survey. At the end of the initial deadline, there were only four responses, which was extremely low, thus the researcher could not get the Cronbach's alpha result from the Statistical Package for the Social Sciences (SPSS) software to check on the internal reliability of each item in the survey questionnaire. There were several possible reasons leading to the very low responses. Firstly, the teachers were busy with their teaching schedule alongside other school programmes. Furthermore, the online survey was shared via the school's Frog VLE platform, but the school Principal did not specifically put highlight on the matter or encouraged teachers' participation. Besides, there was generally a lack of rapport between the researcher and the entire teacher population in the school because the researcher was only given the opportunity to conduct discussions with the school administrators and the three teachers during the entire three days visit to the school.

Therefore, in order to check the relevance of the items in the questionnaire, several other teachers from different schools were contacted and invited to participate in the online survey. This time, a feedback form (see Appendix 11) was emailed to them together with the survey link because as mentioned by Cohen et al., (2011), piloting a questionnaire may also be done by asking several people to give their response regarding the clarity of items, instructions and layout, time taken to complete the survey and ambiguities in wording. At the end of the deadline, six teachers responded and returned their completed feedback forms. Meanwhile, the online survey and feedback form were also extended to two officers from the Educational Technology Division, to gain their insights regarding the questionnaire items from the level of the policymaker. Feedback from the teachers and Educational Technology Division officers showed that

instructions, layout and wordings were clear while the time specified was in accordance with the time they spent to complete the survey. However, one of the Educational Technology Division officers suggested that to facilitate and make it easier for the teachers to give their response, the researcher should slightly adjust a statement in Section 5: Development of Learning Sites. The statement in question should be paraphrased into “I have developed the following number of learning sites” with a new response options of (a) 0 (zero) (b) Between 1 to 10 (c) More than 10. The original statement required the teachers to give their response using a Likert scale.

3.7 ACTUAL STUDY

Since this study involved classroom observations to witness the integration of Frog VLE for teaching and learning, it was considered ideal to start the actual data collection at a time frame between the middle of January until the end of September 2018, because school terms in Malaysia begin in early January and typically end in the month of November. Thus, based on the experience conducting the research methods during the pilot stage, as well as taking into consideration the school term breaks and public holidays both at the state level as well as nationwide, the time line for the actual study was designed to be executed between the months of February to July 2018.

According to the statistics obtained from the MoE Malaysia, as of 31st July 2016 there were 10,180 national schools in the country, of which 2,408 were post-primary schools. At the same time, there were 421,828 certified teachers who were still actively serving for the MoE Malaysia, 181,978 of them were teaching at the post-primary national school level (Ministry of Education Malaysia, 2017).

Due to the large number of schools and teachers in the country, the actual study was only conducted in the state of Selangor, Malaysia. The state was particularly selected because with 277 post-primary national schools, Selangor was among the states with the highest number of post-primary schools in the country. Not only that, the state of Selangor was home to 9 High Performance Schools, which was the highest number compared to other states in the country. As a state with a high number of post-primary national schools in Malaysia, Selangor had a total number of 27,106 post-primary national school teachers as of 31st January 2017 (Selangor State Education Department, 2017). In addition, schools in Selangor had consistently been acknowledged by the MoE as amongst active users of Frog VLE in the country. Therefore, selecting this particular state was deemed appropriate in giving insights regarding teachers' utilisation of the VLE and as a result, the data gathered contributed to address the research questions posed in this study.

Despite having the status of an MoE officer on study-leave, the researcher had to go through the same standard procedure imposed on any researcher conducting studies involving government agencies and national schools in Malaysia. The selection of schools for the multiple-case study was in consultation with officers in the Selangor State Educational Technology Division from late January to early February 2018. The criteria used for the selection included post-primary national schools that were active users of Frog VLE for at least three recent consecutive months and schools in urban as well as sub-urban or rural locations. Another important criterion was to consider the possibility of including the different types of post-primary national schools available in Selangor. As described in Chapter 1, among the different types of national schools in Malaysia

are fully residential schools, religious (Islamic) schools, technical schools, regular national schools and sports schools. Some of these schools have also received MoE acknowledgements such as the recognitions as High-performance Schools, Cluster Schools and School of Global Excellence. For the purpose of the multiple-case study, eight post-primary national schools were identified as the potential case study schools. With reference to the selection criteria mentioned earlier, three of the schools were selected from the list of High-performance Schools while the remaining five consisted of regular post-primary national schools in Selangor. The MoE has given each national school with a similar set of ICT infrastructure to enable access to the VLE platfrom. Hence, the results from the case study schools were hoped to provide examples of best practices for other schools in Malaysia to emulate, with regard to utilisation of the VLE platform for teaching and learning.

As per the pilot phase appropriate approvals were obtained from the relevant authorities in Malaysia. In this case, with the earlier approvals from the EPU and the University's ethics committee, a new application was submitted to the Selangor State Education Department in February 2018. An unexpected delay occurred in gaining the permission from the Selangor State Education Department due to a high volume of similar applications being processed by the department at the time. The final hurdle in the bureaucratic procedure was to seek permission from the Principals of the potential schools for the study. Hence, immediately after obtaining the approval letter from the Selangor State Education Department, the researcher began to contact the first three schools from the list, based on locations and travel convenience for the researcher. In total, from March to July 2018, letters seeking permission from the school Principals were

submitted in stages to all of the eight schools. The letters were submitted either in-person (by-hand), email or via the postal service. In each case, follow-up phone-calls were made to ascertain the results for the permission and the subsequent actions. Throughout the data collection process from the application stage to the school visits, the researcher introduced and maintained her role as a PhD researcher. This was in an effort to reduce potential bias in the form of responses from the case study schools and participants had the researcher exerted her position in the MoE. In addition, the research methods comprising of interviews, classroom observations and a survey were employed in this study to provide a robust data for analysis as well as triangulation in an attempt to address potential researcher bias.

Out of the eight schools contacted, only five schools agreed to participate in the study. The other three schools declined, citing busy schedules and already having too many school programmes. Table 1 represents a brief summary of the eight schools in relation to this study.

Table 1: Summary of Schools Contacted for The Actual Study

School (Potential Case Study)	Types of School	High-Performance School Recognition (Yes /No)	Location	Participation in Case Study
School 1	Regular national school	No	Sub-urban	Declined
School 2	Fully-residential / boarding; Religious (Islamic) School	Yes	Sub-urban	Agreed
School 3	Regular national school; limited boarding for underprivileged students	No	Urban	Agreed

School (Potential Case Study)	Types of School	High-Performance School Recognition (Yes /No)	Location	Participation in Case Study
School 4	Fully-residential / boarding; Religious (Islamic) school	Yes	Sub-urban	Agreed
School 5	Regular national school	No	Urban	Agreed
School 6	Regular national school	No	Urban	Declined
School 7	Fully-residential / boarding; Science secondary school	Yes	Sub-urban	Declined
School 8	Regular national school; Religious (Islamic) school	No	Rural	Agreed

Two other schools were contacted in an attempt to replace the schools that declined to participate in the study. However, both schools were in the midst of conducting assessments and examinations with students, prior to a two-week school break in late August. Hence, it was deemed as unfavourable timing to involve these two schools in the study and thus the final number of the case study schools were five.

3.7.1 Data Collection in the Case Study Schools

The lukewarm response for the online survey during the pilot stage prompted a re-evaluation of how the survey could be best administered in the actual study. Keeping the same research methods as the ones conducted in the pilot stage, it was nonetheless decided that for the actual data collection, the online survey was incorporated as part of the case study rather than the originally intended separate

phase. This was because maintaining the survey as a separate phase such as for a mixed methodology approach would mean that a minimum of 379 responses was required from the post-primary national school teachers across the state of Selangor, based on 95% confidence level and 5% margin of error (Krejcie & Morgan, 1970). Although theoretically it was possible to fully administer the survey via online, it was feared that the response rate would not reach the minimum target within the specified time frame, to achieve valid and reliable findings. In the actual study, all teachers in the case study schools had access to the online survey via their school's Frog VLE platform, as well as other social media channels used by the school community for their internal communication.

Prior to conducting the actual study, the questionnaire was pre-tested for the second time since some items had changed after the pilot phase. A total of fifteen respondents answered the questionnaire. Ten respondents answered via online while the remaining five respondents answered using the hardcopy version. Cronbach's alpha tests were conducted to estimate the internal consistency of items in the survey questionnaire, which were grouped into 5 sections or subscales namely the actual utilisation of Frog VLE, teachers' beliefs and reflections, development of learning sites, Frog VLE trainings and CPDs and barriers to Frog VLE integration. According to Vaskea, Beamana and Sponarski (2017), Cronbach's alpha measures the consistency of item responses or answers to survey questions. The results of the Cronbach's alpha tests are as indicated in Table 2.

Table 2: Cronbach's Alpha Test Results for Second Pre-test

Reliability Statistics			
Subscales	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
Actual Utilisation of Frog VLE	.842	.839	6
Teachers' Beliefs and Reflections	.835	.841	13
Development of Learning Sites	.929	.928	21
Frog VLE Trainings and CPDs	.912	.915	5
Barriers to Frog VLE Integration	.879	.879	9

Based on the table, the Cronbach's alpha results of .842 (actual utilisation), .835 (teachers' beliefs and reflections), .929 (development of learning sites), .912 (Frog VLE trainings and CPDs) and .879 (barriers to Frog VLE integration) indicated high levels of internal consistency in relation to the scale items on the questionnaire. Therefore, it was deemed that the same set of survey questions could be used for the actual study without further modification. During the implementation stage of the actual study, the researcher also prepared hardcopies of the questionnaire as a backup for the online version, in light of the poor online response during the pilot phase. Each of the participating case study school was given forty hardcopies of the questionnaire via their Frog VLE coordinator. The survey participation was opened to all teachers in each case study schools.

Apart from the questionnaire, the complete data collection for each case study school involved the following procedures:

(i) One semi-structured interview with the school administrator;

(ii) Three semi-structured interviews involving three teachers nominated by the school administrator ideally based on three specific criteria; (i) teachers who were excellent/regular users of Frog VLE, (ii) teachers teaching any subject preferably involving Lower Secondary, (iii) teachers of different age groups;

(iii) Three classroom observations involving each teacher involved in the interviews;

(iv) Three sessions of group interviews with students ideally from the classes involved in the classroom observations (four students per session).

3.7.2 An Interview with Policymaker

At the time of the actual study, Malaysia held its 14th General Election on 9th May 2018. As a result, there was a change of political party that ruled the government. Hence, within the MoE, new Members of Parliament (MPs) assumed duties as the Education Minister and Deputy Education Minister. Since the new MPs took office after the General Election, a few on-going MoE programmes were scrutinised and new decisions affected the operation of some of the initiatives. For instance, the nationwide implementation of the second phase of the Malaysia Education Quality Standards, which included part of the assessments in recognising High Performance Schools, had been suspended indefinitely (Ministry of Education, 2018b). Another MoE project involving the development of ten new national-type Chinese primary schools was also suspended (Ministry of Education, 2018a).

As indicated in Chapters 1 and 2, the VLE initiative in Malaysian national schools is a long-term, nationwide ICT in education programme that had been receiving positive and negative responses via reports from the National Audit findings as well as previous academic studies. Thus, out of concern over the future of the expensive VLE initiative under the new administration, an interview with a policymaker in the MoE was added into this study. The interview was deemed necessary to gain some insight and indications of the potential future of the VLE initiative, hence framing the relevance as well as the potential future contribution of this study.

3.8 DATA ANALYSIS

This study included both the quantitative and qualitative data. The quantitative data comprised of responses from a survey involving teachers in the case study schools while the qualitative format contained data from interviews and classroom observations. As this was a multiple-case study involving five schools, data collected from each school was firstly analysed separately as single-case studies. In preparation for the analysis, the researcher did verbatim transcripts for all of the 37 interviews conducted for this study. Since the study comprised of participants from Malaysia, the majority (27) of the interview sessions were conducted in the Malay language. Therefore, the interviews were firstly transcribed into the Malay language to emphasise the contents expressed by the participants. The second process was to translate the transcripts into English for the purpose of data analysis for this study. Due to the number of transcripts that had to be translated within the limited time frame, the researcher had employed two assistants in order to expedite and complete the translation process.

3.8.1 Quantitative Data Analysis

The quantitative data from the survey was analysed using the SPSS software version 24. SPSS was chosen because the software was one of the most widely used statistical packages for social science (Arkkelin, 2014; Cohen, Manion, & Morrison, 2011b; Hinton, McMurray, & Brownlow, 2013). Analyses using SPSS software were conducted firstly based on individual case studies in order to identify unique characteristics of each school in relation to the teachers' responses with regard to Frog VLE utilisation. Subsequently, the quantitative data was analysed at a macro level in order to gauge a broader scenario involving the overall case study schools in Selangor.

At the micro level (individual case study), analyses began with some basic descriptive statistics such as in the forms of frequencies, percentages and mean to provide actual descriptions of findings. For example, a simple frequency analysis was conducted to capture information regarding the respondents' actual integration of Frog VLE for teaching and learning, which involved a continuous (ratio) type variable. Obtaining the frequency level was necessary to provide the basis for an estimate projection of the actual utilisation of Frog VLE in each case study school.

As indicated in Section 3.5.1, the 2013 TALIS report suggested that teachers in Malaysia were teaching at an average of 17 hours per week. In Malaysia, teaching hours vary according to subjects and types of schools as described in Chapter 1. The Standard Based Curriculum for Secondary Schools (KSSM) in Malaysia outlined that core subjects namely Malay language, English,

Mathematics, Science, History and Islamic/Moral studies have more teaching and learning contact hours with the students (Bahagian Pembangunan Kurikulum, 2016). For instance, one class of Malay language subject at post-primary level involves four (4) hours of teaching per week (Bahagian Pembangunan Kurikulum, 2016). Thus, referencing the TALIS average as benchmark, a teacher who teaches Malay language typically has to teach at least four (4) classes in the school. Meanwhile, based on the KSSM guideline, other subjects range from between one (1) to three (3) hours of teaching per week. Therefore, it is possible that teachers majoring in elective subjects such as Visual Arts (one hour per week) or Basic Computer Science (two hours per week) have to teach between 9 to 17 classes.

As suggested by Hinton et al. (2013), SPSS enables researchers to undertake a wide range of statistical analyses that are appropriate to the data gathered from the study. Hence, going beyond descriptive analysis, the researcher had conducted normality tests in SPSS to four continuous variables (age, years of teaching experience, years of experience with Frog VLE and actual utilisation of Frog VLE) in order to check the possibility of performing inferential statistics using parametric tests. Parametric tests such as t-tests, analysis of variance, Pearson correlation and linear regression can only be conducted with specific assumptions associated with the data. One of the common assumptions of parametric tests is that the data is normally distributed in a bell-shaped curve (J.W. Creswell, 2014; Ghasemi & Zahediasl, 2012).

For this study, the results for Shapiro-Wilk tests of normality on age and experiences indicated normal distributions in some of the case study schools.

However, the results for actual utilisation of Frog VLE in every individual as well as the overall case studies yielded the p-value of less than 0.05 to suggest that the data were not normally distributed. Hence, apart from conducting the descriptive statistics as well as Crosstabulation procedure to investigate the relationship between two or more categorical variables, the researcher had the limitation to performing only non-parametric procedures such as the Spearman's Correlation test due to the not normally distributed data. Further elaborations on the statistical tests utilised for the quantitative data analyses will be presented in Chapter 4.

3.8.2 Qualitative Data Analysis

Literature has suggested that there are many ways of analysing qualitative data. In general, there is no one single or correct way of doing it (Cohen, Manion, & Morrison, 2011; Esterberg, 2002; Wellington, 2015). Leech and Onwuegbuzie (2011) described seven types of qualitative data analyses, namely, constant comparison analysis, classical content analysis, keyword-in-context, word count, domain analysis, taxonomic analysis and componential analysis. Each type of analysis involved specific step-by-step procedures meant to assist the researcher in conducting a systematic search for meaning. For example, in an earlier article, Leech and Onwuegbuzie (2007) explained that word counts involved identifying the most frequently used words by the participants. It was highlighted that the more frequent particular words were emphasised by participants, the more important those words or topics were to them (Leech & Onwuegbuzie, 2007). Meanwhile, Clarke and Braun (2017) highlighted another type of qualitative data analysis known as thematic analysis. According to Clarke and Braun (2017: 297), thematic analysis is "a method for identifying, analysing and interpreting patterns

of meaning ('themes') within qualitative data". Whilst there are the different types of analyses, variations in terminology and the number of steps suggested for qualitative data analysis, researchers often adopt some common basic principles and guidelines in order to analyse the data "systematically and reflectively" (Wellington, 2015:260).

In general, the first phase after data preparation involves an immersion stage to get an overall sense or feel for the data (Bazeley, 2013; Tracy, 2013; Wellington, 2015). Literature has also suggested that apart from active reading, the immersion stage also involves the researcher highlighting and taking note of "interesting things in the data" that are potentially useful for the study (Friese, 2014:13). Here, coding is typically used to facilitate a systematic annotating procedure. The process of coding technically refers to assigning a label to a data segment in which the label usually represents the researcher's understanding related to the gist of the passage (Bazeley, 2013; Friese, 2014). At the immersion stage, the systematic annotating procedure is referenced by Tracy (2013) as primary-cycle coding. Similarly, Creswell (2014) described this procedure as open coding while Bazeley (2013) used initial or first-level coding to indicate the same process. According to Tracy (2013:209) primary-cycle coding occurs "with an examination of the data and assigning words and phrases that capture their essence". The process of qualitative data analysis such as annotating or coding can either be done manually or with the help of computer-aided qualitative data analysis software (CAQDAS) such as NVivo, ATLAS.ti and MAXQDA.

Creswell (2014:245) highlighted that "hand coding is a laborious and time consuming process, even for data from a few individuals". Although the use of

CAQDAS is not compulsory for qualitative data analysis, it provides significant assistance especially in sorting, coding, retrieving and managing enormous data (Cohen et al., 2011; Saldana, 2009; Tracy, 2013). Bazeley (2013:18) provided the following elaboration regarding working qualitatively using CAQDAS:

> "Software designed for analysis of qualitative data has increased our capacity to retrieve, sort and interrogate unstructured data in ways that were unimaginable with pencil and paper…The ability to support multiple data types, multimedia and web-based sources, complex data arrangements and querying requirements, multi-site teamwork, and extensive memoing, linking, and visualisation of data are all now standard features of qualitative analysis software".

Taking into consideration that this study contained 37 interview transcripts as well as notes from 8 classroom observations, the researcher after significant consideration decided to conduct the qualitative data analysis using CAQDAS. In relation to this study, the researcher used ATLAS.ti software version 8 for the analysis. ATLAS.ti version 8 was the most current version at the time the researcher began the qualitative data analysis process. The researcher had participated in a demonstration webinar and explored several online tutorials regarding ATLAS.ti for Mac in order to gain familiarity with the software. Prior to making the decision to choose ATLAS.ti software from other CAQDAS, the researcher also took part in a hands-on session using Nvivo version 11. However, during the hands-on session, it was brought to the attention of the researcher that there were limitations in terms of availability of some features and tools to implement the qualitative analysis in Nvivo for Mac. Therefore, ATLAS.ti was chosen for this study because as an Apple Mac computer user, the researcher felt more comfortable and satisfied with the features and layout presented in ATLAS.ti for Mac compared to the NVivo for Mac version.

Before starting with the primary-cycle coding or the immersion stage, the researcher created 'Document Groups' within ATLAS.ti to organise the qualitative data according to the 5 case study schools (see Appendix 12). Sorting the documents based on case study schools expedited the retrieval of data and eased the researcher in firstly conducting the qualitative analysis separately as single-case studies. However, unlike SPSS software that was also used in this study to generate test results for quantitative data, ATLAS.ti as well as other CAQDAS could not actually analyse the qualitative data for the researcher (Cohen et al., 2011; Friese, 2014; Wellington, 2015). Instead, its function was to support the process of qualitative data analysis as elaborated in the above quotation by Bazeley (2013). Hence, after sorting the data in Document Groups, the researcher adopted the thematic analysis approach to execute the primary-cycle coding stage as described earlier. Within ATLAS.ti, the researcher conducted active reading, highlighted quotations and created new codes for the highlighted segments of the data. According to Friese (2014:1) the researcher has to "tell the computer, by way of coding, which data segment has what kind of meaning".

Creswell (2014:248) suggested three categories of codes, namely "codes on topics that readers would expect to find, based on past literature and common sense", "codes that are surprising and that were not anticipated at the beginning of the study" and "codes that are unusual and that are, in and of themselves, of conceptual interest to the readers". Creswell's first category of codes corresponds with the deductive coding strategy while the second and third code categories portray the inductive process (Wellington, 2015). According to Yin (2014) as cited by Wellington (2015:173), researchers analysing and reporting

case study data “can and often will employ both inductive and deductive strategies”. In thematic analysis, Clarke and Braun (2017:298) explained that it was possible for codes to be “both inductive (data-driven) and deductive (theory-driven)”. With regard to this study, since qualitative data analysis was a new process and learning experience for the researcher, ideas for the codes especially at the initial stage of primary-cycle coding were mostly deductive in nature. The codes were derived from literature and theories. Apart from that, they were also formulated with reference to the research questions as well as interview schedules and classroom observation guidelines. Clarke and Braun (2017:297) explained that in thematic analysis, the aim was “not simply to summarise the data content, but to identify, and interpret, key, but not necessarily all, features of the data, guided by the research question”. During this primary-cycle coding stage, focus was mainly on descriptive information such as the ‘who’, ‘what’, ‘where’ or ‘when’ of a particular topic of discussion (Friese, 2014; Tracy, 2013). Less inductive coding occurred during the primary-cycle phase because in the words of Friese (2014:116), coding from the ‘bottom-up’ or “emerging from the data” was “not so easy for a beginning researcher”.

Nonetheless, Teddlie and Tashakkori (2009) as cited by Cohen et al., (2011a) highlighted that qualitative data analysis is an iterative procedure. The same idea was echoed by Friese, (2014:16) who used the phrase “recursive process”. Hence, both deductive and inductive coding occurred when the researcher revisited the qualitative data not only at the primary-cycle but also during the secondary-cycle coding stage. In secondary-cycle coding, attention was to specify the ‘why’ and ‘how’ something happened, thus leading to formulation of interpretive second-level or focused codes (Tracy, 2013). The list of codes was

then reviewed after reaching the first saturation point. Friese (2014:128) highlighted that the coding saturation point in ATLAS.ti occurred when the researcher began to mainly “drag and drop existing codes from the Code Manager onto the data segments”. The existing code list review was conducted by means of sorting, renaming or merging codes that used different labels but appeared to have the same meaning or context.

Meanwhile, the code list in ATLAS.ti is displayed in a linear direction and by default sorted in alphabetical order. Therefore, Friese (2014:130) emphasised the importance to “play with the code labels in order to add some structure to the list”. For example, the researcher used capital letters and added prefixes to separate the main categories from the subcategories (see Appendix 13). As advised by Friese (2014), renaming code labels in such a manner enabled all the subcategories to automatically be sorted under the main category names. The main categories were developed as labels referring to the research questions while the subcategories consisted of deductive and inductive codes associated with the research questions. Having the code list organised according to main and subcategories helped the researcher to prepare for the next level of analysis. A step further after the coding process was to utilise the query tools available in ATLAS.ti in order “to find patterns and relations in the data” (Friese, 2014:167).

Query tools in ATLAS.ti can be used to assist different levels of qualitative data analysis. For example, the simplest form of query was to create an output for a codebook in the Code Manager. The codebook was a simple retrieval method that enabled the researcher to review the list of codes and their associated quotations (see Appendix 14). Meanwhile, the network view function was useful

to visualise links between codes. In the Network Manager, the researcher had options whether to display only the codes and how they relate to one another, or also include the related quotations, comments and memos to give more detailed descriptions (see Appendix 15). Both the codebook and network view helped the researcher to explore patterns and identify relations that were connected with the research questions. Apart from that, as qualitative data analysis was a recursive process, the researcher also benefited from the visual outputs because it was easier to cross-check the suitability between quotations and their attached codes. In some cases, the researcher had occasionally revisited the documents to recategorise some codes to generate better understandings of the data.

3.9 GENERALISABILITY AND VALIDITY

One of the issues that has been commonly highlighted in literature is the aspect of generalisability of a case study. Critics argue that case studies have limited opportunity for generalisation, because each case is subjective or relative to the individual (Cohen et al., 2011a; Gomm et al., 2000; Simons, 2009; Yin, 2009). However, case study researchers are reminded that the case study does not represent a sample of the population the same way another study such as a survey does, hence ideas such as representativeness or statistical generalisation may be irrelevant (Gomm et al., 2000; Simons, 2009; Stake, 1995; Yin, 2009). Denzin (1983) as cited by (Gomm et al., 2000:70) suggested that “the interpretivist rejects generalisation as a goal and never aims to draw randomly selected samples of human experience. For the interpretivist, every instance of social interaction, if thickly described (Geertz, 1973), represents a slice from the life world that is the proper subject matter for interpretive inquiry”.

On a similar note, Cohen et al., (2011:434) suggested that "though it is frequently useful to record typical, representative occurrences, the researcher need not always adhere to criteria of representativeness…Case studies, in not having to seek frequencies of occurrences, can replace quantity with quality and intensity, separating the *significant few* from the *insignificant many* instances of behaviour". Here, it suggests that instead of trying too hard to achieve generalisation, case study researchers should focus more on gaining insights through in-depth exploration and interpretation of the case, in order to increase understanding of the complex social settings or phenomena, the point that have been described earlier in Section 3.3 and Section 3.3.2.

Nonetheless, although it may have been given low priority, there are some recommendations on how researchers should deal with the issue of generalisability in case studies. For example, instead of linking this research methodology to statistical generalisation, researchers prefer to associate case studies with either naturalistic, analytic or thematic generalisation or alternatively with the concept of transferability (Gomm et al., 2000; Simons, 2009; Stake, 1995; Yin, 2009). Naturalistic, analytic or thematic generalisation as well as transferability, although proposed by different researchers, are referring to more or less the same concept, occurring when individuals recognise similarities and differences of a case, in which they can relate to their own situations (Gomm et al., 2000; Simons, 2009; Stake, 1995; Tracy, 2013; Yin, 2009).

This is also similar to the concept of fuzzy generalisation as described by Bassey (1999:52) whereby "there is an invitation to 'try it and see if the same happens to you'" because "something that has happened in one place may also happen

elsewhere". For instance, one finding from a case study in an educational institution may highlight the importance of support and motivation from the head or management of the institution, in order to ensure a successful implementation of a particular programme. Readers or individuals who either come from a similar education background or a totally different environment such as healthcare, may agree with the notion because they possibly have had previous experiences that they can identify with the current case study finding. Furthermore, as Simons (2009) reiterated, in case studies research, apart from acquiring in-depth understanding, the other consideration should be about the usability of the findings to be used in other contexts or by others.

By doing multiple-case study, the researcher has the opportunity to present potentially similar or different findings not only from an individual case but also make comparisons between the cases. Thus, there is a probability that the findings can be replicated to or identified by a wider audience. Not only that, achieving transferability and potentially increasing the usability of the findings also mean that there is external validity to the study's findings. External validity refers to whether the findings of a study are generalisable beyond the immediate case study (Cohen et al., 2011a; Yin, 2009). Apart from external validity, the different methods of data collection involved in this study served as an effort to achieve several targets, namely gaining in-depth understanding of the case, for triangulation purpose as well as to increase construct and concurrent validity.

3.10 SUMMARY

This chapter has outlined and discussed the methodology for the study, starting with revisiting the background that motivates the researcher to examine the area

of teachers' utilisation of VLE and the questions developed to frame this study. Discussions have also been included in relation to the research paradigm, ontology and epistemology that influence the researcher in deciding on specific methodology and methods to be adopted in search for answers to the research questions. This research is based on a multiple-case study design, influenced by a constructivist epistemology and interpretevist paradigm, emphasising on capturing data from participants in their natural setting. The different methods and instruments involved in this study will hopefully provide rich data for the researcher to analyse and interpret, firstly as separate single cases and secondly in a cross-case manner. By doing so, it is hoped that the researcher will be able to gain in-depth understanding of the topic by highlighting similarities and differences within and between cases. At the same time, it is hoped that the findings from this study will contribute recommendations that may be used specifically to improve VLE utilisation in Malaysian post-primary national schools, and also to provide an important reference for the general academic society, regarding a case study research focusing on the utilisation and impact of VLE, especially on a nationwide implementation.

CHAPTER 4: RESULTS AND FINDINGS

4.0 INTRODUCTION

This chapter presents the results and findings from the main study. The structure of presentation is divided into two main parts. Part 1: The Case Studies begins with an elaboration of results and findings based on individual case analysis from the participating schools. In order to set an overview with regard to the utilisation of Frog VLE, each individual case study report starts with some background information of the school and followed by an analysis of the demographic information of participants involved in the study. Presentation of the results for the individual case studies are categorised according to themes identified during the data analysis process. The main themes are associated with the teachers' actual utilisation of Frog VLE for teaching and learning, the teachers' Frog VLE utilisation factors, further utilisation of Frog VLE for teachers' professional practice, school highlights and Frog VLE implementation challenges.

The same themes are repeated in the presentation for each individual case analysis to form the basis for Part 2 (cross-case analyses between the different case study schools). Results from the quantitative data were derived from descriptive and inferential analyses conducted using the SPSS software. Findings from the qualitative data analyses resulting from the coding processes using ATLAS.ti are integrated into the case study reports to provide detailed elaborations and depth. Data analyses from classroom observations involving some of the teachers were also included to support findings from the other qualitative and quantitative data.

Part 2 consists of findings from cross-case examinations between the case study schools as well as the overall quantitative analysis results from the teacher survey. This reporting structure is adapted based on several presentations of multiple case studies conducted by the OECD, UNESCO and some previous thesis submitted for doctoral degrees (T. Burns, Köster, & Fuster, 2016; Flynn, 2013; Ross, 2012; UNESCO, 2011). To ensure anonymity with regard to the participating case study schools, pseudonyms derived from terms associated with technology are used in place of the actual school names. Table 3 illustrates the pseudonyms for each case study school.

Table 3: Details of Case Study Schools and Their Pseudonyms.

Case Study Schools	Type of School	Location	Pseudonyms
Case study school 1	Fully residential / boarding religious (Islamic) school; High-performance school recognition.	Sub-urban	Avatar
Case study school 2	Regular national school; limited boarding for underprivileged students.	Urban	Symfony
Case study school 3	Fully residential / boarding religious (Islamic) school; High-performance school recognition.	Sub-urban	Pascal
Case study school 4	Regular national school.	Urban	Fortran
Case study school 5	Regular national religious (Islamic) school.	Rural	Pixel

Part 1: The Case Studies

4.1 Avatar

Avatar was a boarding or fully residential school located in a sub-urban area in the Selangor state. It was established in 1989 as a post-primary national religious boarding school. Avatar was a co-educational school that catered for students between the ages of 13 years to 17 years old (studying at Form 1 to Form 5 Malaysian post-primary national school levels). Students' intakes in Avatar were based on excellent academic and co-curricular backgrounds during their primary school level. The students came from many different states in Malaysia because of the fully residential school status. In other words, student enrolments were not restricted to those living in the nearby areas or within the Selangor state only. Therefore, due to the policy of emphasising academic and co-curricular excellence as well as the availability of hostel facility, students in Avatar came from various socio-economic backgrounds including low, middle and high-income families.

At the time this study was conducted, there were 631 students and 67 teachers in Avatar including the school administrators (Principal and 3 senior assistants). As a post-primary national religious boarding school, students in Avatar typically studied between 13 to 14 subjects associated with the Sijil Pelajaran Malaysia (SPM) examination, or Malaysian Certificate of Education. The SPM is the penultimate examination involving post-primary national school students in Malaysia, before entry to the Sixth Form, Matriculation or other tertiary education.

4.1.1 Participants' Demographic Information

A total of 32 respondents took part in the teacher survey in which only 3 responses were received via online while the other 29 respondents answered the questionnaire using the hardcopy version. The majority of respondents were female (27 teachers, 84.4%) and only 5 (15.6%) of them were male respondents as represented in Figure 4. Data indicated by the Selangor State Education Department portrayed that there were 83% female teachers compared to 17% male teachers in post-primary schools around Hulu Langat district which was within Avatar's locality (Jabatan Pendidikan Negeri Selangor, n.d.). Therefore, the distribution of teacher participation in Avatar was almost similar in comparison with the population of teachers in the district.

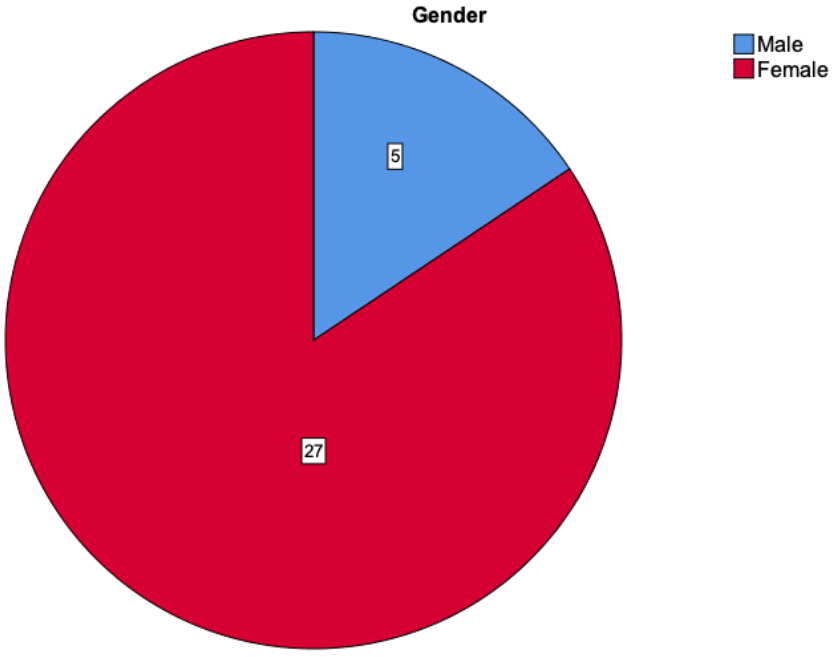


Figure 4: Respondents' Gender Distribution (Avatar).

Meanwhile, Figure 5 displays the respondents' age whereby the youngest was 25 years old and the oldest was 54 years old.

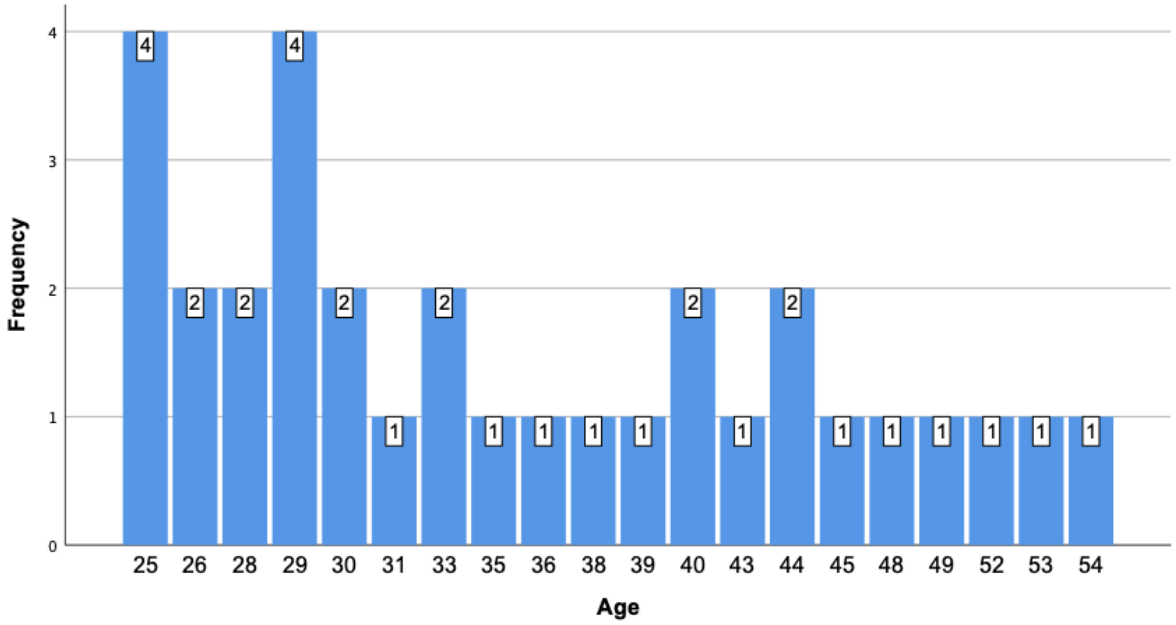


Figure 5: Respondents' Age Distribution (Avatar)

A summary of the subjects taught by the respondents is portrayed below.

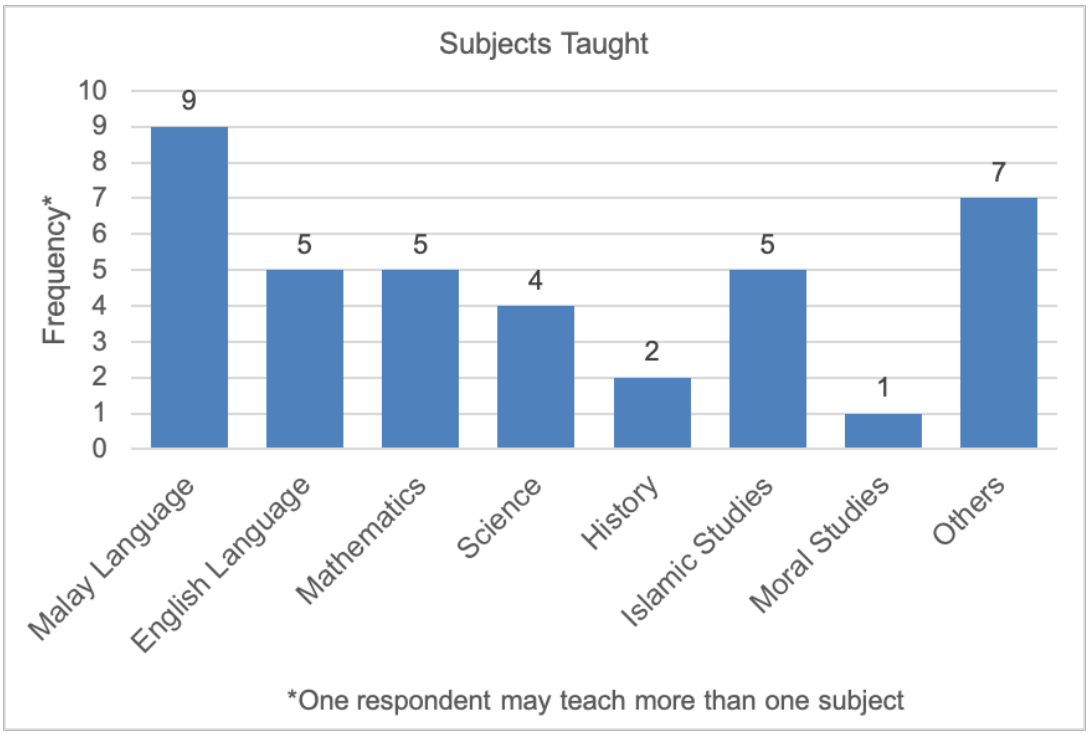


Figure 6: Subjects Taught by Respondents (Avatar)

In relation to experience with Frog VLE, 15 respondents (46.9%) indicated that they only had approximately 1 year of utilisation experience compared to 4 teachers (12.4%) who had been using Frog VLE for 4 years. Table 4 details the information regarding the teachers' Frog VLE experience.

Table 4: Year(s) of Experience Utilising Frog VLE (Avatar).

Number of Years	Frequency	Percent
1	15	46.9
2	6	18.8
3	7	21.9
4	4	12.5
Total	32	100.0

Three teachers took part in interview sessions that were conducted to glean in-depth information regarding their experiences of utilising the VLE platform. Table 5 presents a summary of the demographic information and pseudonyms used for the 3 teachers interviewed in Avatar. Amira and Saleha taught their respective subjects to the Lower Secondary classes, involving the Form 1 (13 years old), Form 2 (14 years old) and Form 3 (15 years old) students. Meanwhile, Sheila taught Islamic studies for the Form 2 students (14 years old) while the Islamic and Sharia studies were for the Upper Secondary students, namely the Form 4 and Form 5 (16 and 17 years old students).

Table 5: Teacher Pseudonyms and Demographic Information (Avatar).

Teacher & Pseudonym	Gender	Age group	Years of teaching experience	Subjects taught in Avatar
Teacher 1: Sheila	Female	30s	5	Islamic Studies, Islamic and Sharia Studies
Teacher 2: Amira	Female	30s	5	Arabic language
Teacher 3: Saleha	Female	40s	11	English

A total of 12 students were interviewed regarding their experience with Frog VLE. Table 6 displays a summary of the students' demographic information and pseudonyms.

Table 6: Demographic Information and Pseudonyms of Avatar Students involved in the Interview Sessions.

Student Group Number	Age & Class / Level	Gender	Count	Pseudonyms
One	14 years old, Form 2	Boys	2	Ali, Ahmad
		Girls	2	Farhani, Rina
Two	14 years old, Form 2	Boys	0	-
		Girls	4	Wani, Bazilah, Fitrah, Trisha
Three	15 years old (1 student), Form 3 & 16 years old (3 students) Form 4	Boys	4	Kimi, Ben, Ariff, Malik
		Girls	0	-
Total number of students			12 students (6 boys, 6 girls)	

4.1.2 Teachers' Actual Utilisation of Frog VLE for Teaching and Learning

(a) Frequency of Integration

Statements referring to one section in the teacher survey required the respondents to make reference to any one particular class that they were teaching when indicating the frequency of Frog VLE utilisation. The results from the survey in Avatar revealed that 16 respondents (50.0%) reported they integrated Frog VLE for teaching and learning with their students approximately once a month. Thirteen respondents (40.7%) indicated that integration of Frog VLE for teaching and learning occurred more than once per month while 3 respondents (9.4%) admitted they never utilised the VLE platform for teaching and learning (see Figure 7). As described in 3.8.1, the TALIS report suggested that teachers in Malaysia were teaching an average of 17 hours per week (OECD, 2016). Meanwhile, the MoE had issued a guideline indicating time allocations for

each subject taught in Malaysian post-primary national schools (see Appendices 16 and 17). Therefore, with reference to the TALIS report, the designated time allocations and the subjects taught by the respondents in Avatar (displayed in Figure 6), a respondent who specified in the survey that he or she utilised Frog VLE only once per month for teaching and learning could actually be integrating the platform around 4 to 6 times per month if taking into consideration all the taught classes. Hence, this study found that the actual utilisation of Frog VLE for teaching and learning by the respondents in Avatar was generally at a moderate level (see Appendix 18 for an example of the calculation).

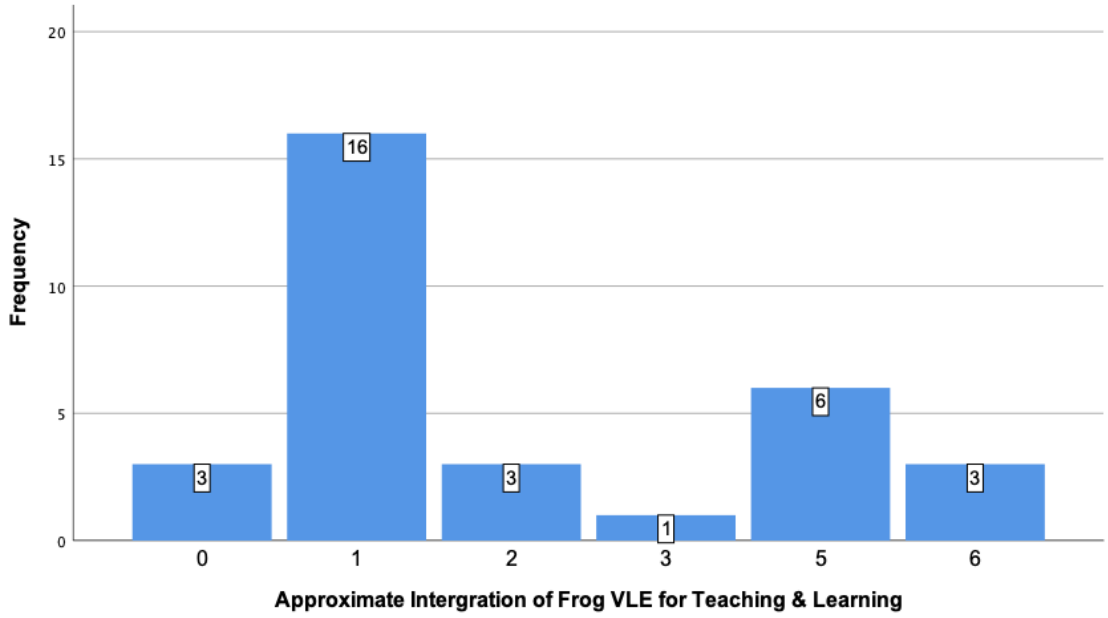


Figure 7: Approximate Integration of Frog VLE for Teaching and Learning in Avatar (per month).

In the meantime, the result from Spearman's Rank Order (rho) correlation test between age and actual Frog VLE utilisation yielded a r_s = -.472 and p < 0.01. Hence, there is a moderate negative correlation between age and actual Frog VLE utilisation among the respondents in Avatar. In other words, the younger the respondents' age, the more times they integrate Frog VLE for teaching and learning with the students.

(b) Utilisation of Specific Features in Frog VLE

Based on the results in Table 7, the mean score of 1.75 for the first item, "Teacher assigns homework to students" was the highest. This suggests that the function in Frog VLE that enabled teachers to assign homework was most widely used by the respondents in Avatar. However, the majority of respondents (18 teachers, 56.3%) reported that they only utilised the 'assign homework' feature once a month with each class that they were teaching. The result from this survey also found that teachers tended to give little feedback via Frog VLE to students regarding their homework. For instance, Table 9 revealed that many respondents (13 teachers, 40.6%) never utilised Frog VLE to give feedback to students, followed by 12 respondents (37.5%) who usually did it once a month and 4 respondents (12.5%) who gave feedback via the platform once a week. Only 3 respondents (9.4%) stated that they gave feedback to students more than once a week through Frog VLE.

Table 7: The results for actual utilisation of specific features available in Frog VLE (Avatar).

No.	Survey Item	Never		Once a month		Once a week		More than once a week		Mean
		f	%	f	%	f	%	f	%	
1	**Teacher assigns homework to students**	4	12.5	18	56.3	5	15.6	5	15.6	**1.75**
2	Teacher utilises Frog VLE to give feedback to students about homework	13	40.6	12	37.5	4	12.5	3	9.4	1.16
3	Teacher communicates with students' parents via Frog VLE	27	84.4	3	9.4	1	3.1	1	3.1	0.31

Legend: f (frequency), % (percentage).

The results portrayed on Table 7 also suggested that Frog VLE was least utilised by the respondents for communication purpose. Apart from giving little feedback regarding students' homework via the VLE platform, the lowest mean score of 0.31 suggested that communication almost never occurred between the teachers and the students' parents via Frog VLE. A large majority of the respondents (84.4%) highlighted that they never utilised Frog VLE for that purpose. Similarly, results associated with another statement in the teacher survey also demonstrated that 12 respondents (37.5%) never utilised the VLE platform to communicate with their students. Although a total of 20 respondents (62.5%) indicated that communication did occur between the teachers and students via Frog VLE, 9 respondents (28.1%) revealed that the communication happened 'rarely'. Another 7 respondents (21.9%) recorded that the teacher-student communication 'sometimes' occurred via the VLE platform while 4 respondents (12.6%) indicated that communication 'often' transpired between the teacher and students via Frog VLE.

(c) Application of Frog VLE for Teaching and Learning in Avatar

The results from a cross-tabulation analysis between gender, age groups and main reasons for Frog VLE utilisation revealed that in general, the respondents in Avatar integrated Frog VLE in teaching and learning mainly to provide their students with additional resources in order to enhance understanding of topics (see Table 8). The researcher had the opportunity to observe one lesson conducted by Sheila. During Sheila's lesson, integration of Frog VLE occurred as an enhancement activity for her students. They were given the opportunity to access their Frog VLE accounts and viewed video clips shared earlier by Sheila related to the topic she was teaching. Sheila asserted that it was typical for her

to embed video clips on her Frog VLE learning site to help her students gain better comprehension of topics. For example, when teaching the topic of Islamic Hajj or pilgrimage, it was challenging for Sheila to provide accurate descriptions of places in the Holy land since she had not been there yet. Therefore, Sheila decided to embed into Frog VLE a video describing the Hajj journey to assist the students' understanding.

Meanwhile, the main reasons selected by respondents in the younger age groups (20s and 30s), tended to reflect the 21st century teaching and learning approach such as encouraging group collaborations, expressing opinions as well as discovering and presenting new ideas (labeled (iii) and (iv) in Table 8). Although there were 6 respondents in the 20s age group who utilised Frog VLE mainly to provide their students with additional resources and to test the students' understanding, 5 other respondents integrated the platform to provide opportunities for exploration of topics, encourage group collaborations and presentations of new discoveries. This was in contrast with the main reasons for Frog VLE integration cited by respondents in the 50s age group, namely limited to providing additional resources and as a means to test students' understanding of topics.

The researcher also had the opportunity to observe one of Saleha's English Language lessons. During the lesson, Saleha utilised Frog VLE to facilitate the students' group activities. Frog VLE was more optimised during Saleha's lesson than in Sheila's class. It was evident that Saleha became a facilitator, guiding her students to complete group tasks using Frog VLE. Whilst the students were logged on to their Frog VLE accounts, a discussion was held with reference to

the group reports that had been shared with the whole class via the VLE platform. Saleha held a strong believe in promoting collaborative work among her students. According to her,

> "…when it comes to collaboration or collaborative assignments, I think the best method is using technology…The time is utilised wisely throughout the 35 minutes…We're using the same system where everybody is connected, then the collaboration comes along" (Saleha, 29th June 2018).

Although the researcher did not have the opportunity to observe Amira's lesson, the teacher highlighted that the main reason for her to integrate Frog VLE in teaching and learning was because she wanted her students to be aware of the multiple online resources and references to help them improve their Arabic language. Thus, Amira regularly shared with her students the links to relevant websites and online resources via Frog VLE. Indirectly, she hoped that her students developed more positive attitudes and be more responsible towards their own learning. According to Amira, those positive traits were important and relevant even at university level.

Table 8: Cross-tabulation analysis between gender, age groups and their main purpose for integration of Frog VLE (Avatar).

Age groups	Gender	Not applicable	(i) To provide additional resources	(ii) To provide additional resources and test students' understanding	(iii) To allow students to further explore topics and express opinions (discussions & debates)	(iv) To allow students for further exploration of topics, collaborate in groups and present new discoveries	Total
20s	Male	0	1	0	1	1	3
	Female	1	3	2	1	2	9
30s	Male	0	0	0	0	0	0
	Female	3	2	2	0	2	9
40s	Male	1	0	0	0	0	1
	Female	3	3	0	1	0	7
50s	Male	0	0	1	0	0	1
	Female	0	1	1	0	0	2
Total		8	**10**	6	3	5	32

4.1.3 Teachers' Frog VLE Utilisation Factors

(a) Suitability for The Education System

Findings from the teacher survey suggested that many of the respondents in Avatar held positive beliefs regarding the implementation of Frog VLE in education. For example, 21 respondents (65.6%) considered Frog VLE as suitable to support the curriculum and subject syllabi. During the teacher interview, Amira explained that sometimes, results from quizzes as well as other individual or group projects completed via Frog VLE were documented as part of the students' formative assessments. Meanwhile, Sheila was teaching the Form 5 students who were preparing for SPM public examination. Although Sheila admitted that she integrated Frog VLE for face-to-face teaching and learning more often with her Form 2 and Form 4 students, utilisations with her Form 5 students mostly occurred for assignments during school holidays. In class, the Form 5 students were required to do more presentations hence Sheila did not impose any restrictions on the tools used to aid their presentations. Nevertheless, the Form 5 students still had the benefit of accessing materials and notes in Frog VLE to prepare for the presentations as well as their SPM examination.

With regard to examinations, Sheila believed that as an Islamic studies teacher, her teachings were for life, not only for examinations. Therefore, she emphasised on adopting different teaching methods including the use of the VLE platform to ensure that her students gained understanding and had easy access to references that enabled them to practice at least the basics of the Islamic teachings. As highlighted by Sheila,

> "When it was just chalk and talk, it seemed like they (the students) were not paying enough attention. When they got to go into the computer lab, they became more focused…they were on board with us" (Sheila, 12th April 2018).

(b) Teacher-related Factors

As someone who was always keen on ICT, Sheila began to self-explore Frog VLE as she started working in Avatar. Sheila's first attempt with Frog VLE was hampered by some difficulties but with the help from other teachers from around the country who communicated via a social media application (Telegram), Sheila was able to solve her problem. She told the researcher that since then, she became so much more excited about further exploring and utilising Frog VLE for teaching and learning.

In contrast, Amira's motivation to try out Frog VLE with her students was instigated after observing Sheila and other teachers in Avatar optimising the computer laboratory to conduct lessons with Frog VLE integration. Hence, Amira is an example of an inadvertent user based on the Teacher ICT Integration model developed by Donnelly et al. (2011). Inadvertent users are teachers who utilise the technology because of external factors such as school culture and peer pressure. In Amira's case, she felt curious and a little pressured seeing her colleagues integrating Frog VLE for teaching and learning. Hence, after changing the computer keyboard setting to enable typing in Arabic, Amira started to integrate Frog VLE in teaching and learning.

There were other teachers in Avatar who demonstrated that utilisation of Frog VLE occurred due to external factors. For example, results from the teacher

survey revealed that 21 respondents (65.7%) reported the main reason for them utilising Frog VLE was to adhere to instructions from the school administrators or the MoE. On that note, 21 respondents (65.6%) felt that they were more motivated to utilise Frog VLE whenever there was encouragement from the school administrators. In addition, 18 respondents (56.3%) reported that they received adequate assistance when they encountered some technical issues with Frog VLE. Similarly, since joining Avatar, Saleha highlighted that she became more active in utilising the platform. However, her reason was mainly due to adherence to instructions from the higher authority.

> "…took it as instruction from the Ministry, expensive investment. We had our own online system…but not Frog…when we were given the instructions (to use Frog VLE)…I think we have to try to utilise it as much as we can" (Saleha, 29th June 2018).

Meanwhile, comparing the results between the respondents' self-assessment regarding their Frog VLE utilisation skills and CPD sessions, although the majority of respondents (30 teachers, 93.7%) claimed to have general utilisation skills between low to advanced levels, 18 respondents (56.3%) indicated insufficient CPDs regarding *how* to integrate Frog VLE for teaching and learning. Such findings suggested the need for more consistent hands-on CPD sessions focusing on *how* to integrate the VLE in teaching and learning, as well as showcasing best practices related to utilisation of the VLE platform.

(c) Student-related Factors

Based on the teacher interviews, apart from providing supplementary materials (videos, notes, assignments and links to other websites), it was also typical for teachers to utilise Frog VLE for the purpose of conducting educational games and online quizzes for the students. The most common educational game

organised by the teachers via Frog VLE was Kahoot! because it was also a popular choice among students in Avatar. One of the reasons cited by the teachers for incorporating gamifications was to test the students' understandings of the topics, in a fun and enjoyable process. Malik and Ariff, two of the students interviewed also emphasised the excitement of playing educational games on the VLE platform.

> "Having to use Frog VLE while studying suits well in this 21st century because we (the students) use a lot of ICT in daily life. With this VLE, students are able to play games while studying, which is more fun!" (Malik, 29th June 2018).

Results from the interviews also suggested that students were able to get immediate feedback by answering questions via the online quizzes or educational games. As a consequence, Amira highlighted that since the students were able to get immediate answers, the teachers also gained benefit because they were able to "solve the problem of marking students' books that are time consuming" (Amira, 3rd May 2018). Besides, Amira added that there tended to be more discussions after the quiz sessions and students liked to ask questions such as "Why is the answer not this one?" (Amira, 3rd May 2018). Similarly, by answering the online quizzes or playing the educational games via the VLE platform, there was no need for the students to bring home many books to complete their homework (see Table 9). Thus, it helped to reduce the much-debated issue of students carrying heavy school bags.

Based on Table 9, among other popular reasons given by students in Avatar were because with Frog VLE utilisation, they had the opportunity to do more typing or clicking of a button instead of the conventional writing. Furthermore, since Frog VLE functioned similar to a single-sign-on for students to access the world wide

web in a safe educational environment, the students also liked the idea of being able to have easy access to references and resources to assist them in gaining better understanding or completing their assignments. Ben highlighted that sometimes he misplaced his reference books and papers, thus using Frog VLE was definitely a better option (see Table 9).

Table 9: Avatar Students' Reasons for Enjoying the Utilisation of Frog VLE.

Item	Reasons	Students
1	I don't like to write	Ali, Ahmad, Rina, Trisha, Fitrah
2	There's no need to carry heavy books or bags	Ali, Rina, Farhana, Malik
3	There is easy access to references and materials from the internet	Trisha, Ben, Bazilah, Farah
4	I like using less papers	Fitrah, Ben, Kimi
5	I can submit homework straightaway	Farhani, Wani
6	Fun and not bored (can study and play games at the same time)	Ariff, Malik

4.1.4 Further Utilisation of Frog VLE for Teachers' Professional Practice

(a) Development of The Teachers' Learning Sites

As portrayed in Figure 8, the majority of respondents (20 teachers, 62.5%) recorded that they had developed between 1 to 10 learning sites in Frog VLE. Nine respondents (28.1%) had never developed any learning site while only 3 respondents (9.4%) indicated they had developed more than 10 learning sites. Therefore, the results suggested that in Avatar, the extent of teachers' involvement in learning site development for Frog VLE was between a low to a moderate level.

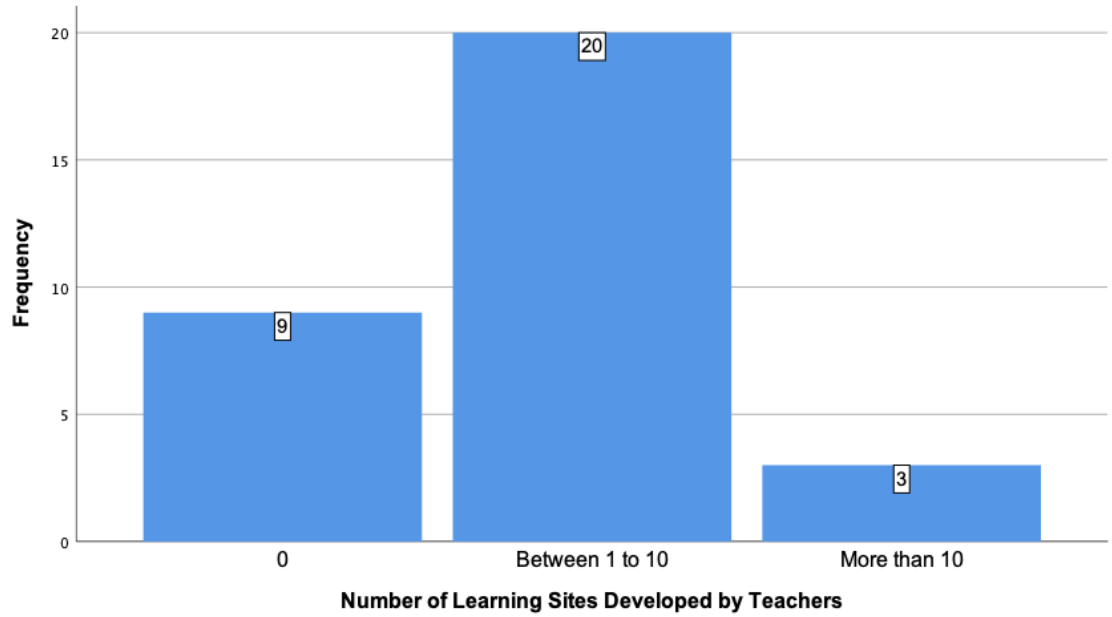


Figure 8: Learning Sites Development (Avatar)

Analysis from the teacher interviews revealed that Saleha was actively developing her learning sites on the VLE platform. To ensure consistent utilisation of Frog VLE in teaching and learning, Saleha had prepared schedules for assignments or quizzes to be given to her students. The assignments, quizzes and other activities were uploaded on her learning site and shared with the students according to the schedules. Furthermore, Saleha informed that she shared the teaching and learning materials not only with other teachers in her school but also in the MoE repository. She explained, "I've been making everything public. There's a button to publicise. When I share with my students, I also click 'Publicise'. There's nothing to hide. I mean, I just share it" (Saleha, 29th June 2018). In contrast, Sheila revealed that apart from sharing with her students, she only shared her materials in her learning site with other teachers in the same subject panel. When asked for the reason for not publicising to the MoE

repository, Sheila (12th April 2018) responded, “Urmm… why? I guess I’m not up to it yet. I don’t dare because I only make simple materials”.

Meanwhile, Figure 9 represents the result from the teacher survey regarding self-assessment on learning site development skill. Based on the result, 29 respondents (90.7%) regarded themselves as having between low to advanced skill levels while only 3 respondents (9.4%) indicated that they had no skill at all. However, most of the respondents (15 teachers, 46.9%) suggested that their learning site development skill was only at a low level.

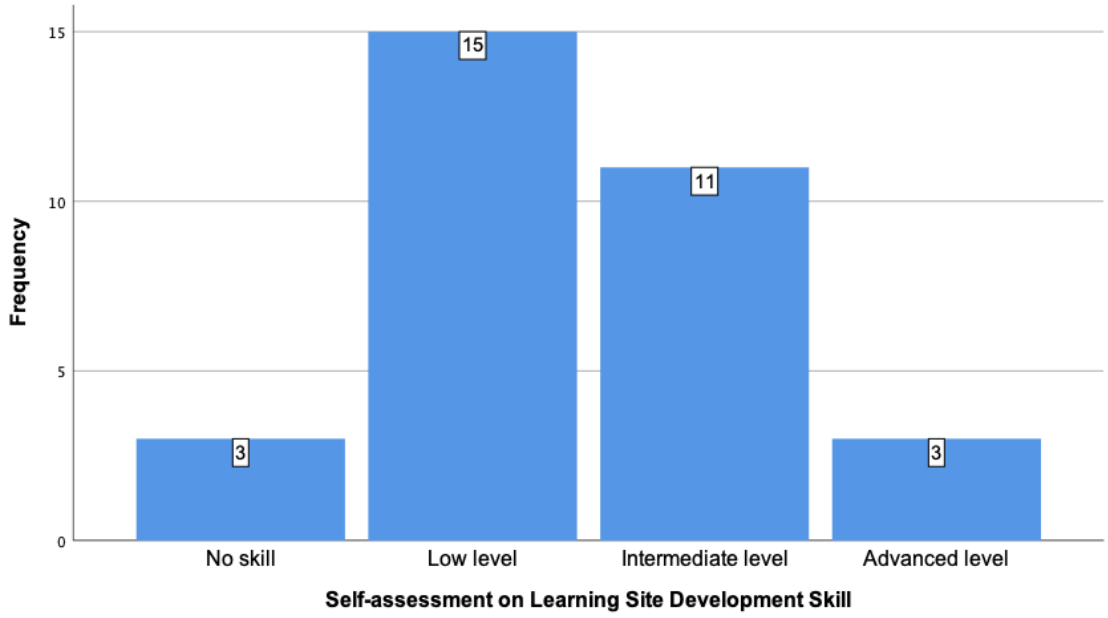


Figure 9: Avatar Teachers’ Self-assessment on Learning Site Development Skill.

Saleha described that when Frog VLE was at its early years of implementation, the interface and overall system was not user-friendly. Hence, teachers found it difficult to use especially in developing learning sites. Nonetheless, there had been improvements over the years and Saleha informed that she noticed more teachers in Avatar became more familiar with the VLE widgets. Hence, more teachers in Avatar started to use the VLE platform. Based on the teacher survey,

the media widget was most commonly used as indicated by 23 respondents (71.9 %). This was followed by 21 respondents (65.6%) who indicated that they used the 'link to file' widget to develop their learning sites. On the other hand, the least utilised tool was the forum widget whereby 19 respondents (59.4%) revealed that they had never used the widget. Hence, this emphasised the lack of utilisation of the VLE platform for communication purpose, as highlighted in 4.1.2 (b).

Referring to Table 10, the main reason for teachers' involvement in learning site development as cited by the respondents was to diversify their teaching approaches. During the survey, the respondents were allowed to select more than one reason for this statement. As portrayed in Table 10, another important reason highlighted by the respondents were developing the learning sites for their own future teaching reference. Indeed, one of the functions of Frog VLE was to serve as a repository for teaching and learning materials (FrogAsia, 2016). Hence, teachers were able to save their educational resources in the cloud storage available on the VLE platform. Developing learning sites to aid students' independent learning was also a popular reason emphasised by the respondents (see Table 10). This resonates with the respondents' main reason for utilising Frog VLE in teaching and learning which was to provide the students with additional resources in order to assist understanding of topics (see Table 8 in 4.1.2 (c)).

Table 10: Reasons for Learning Site Development (Avatar).

No.	Reasons	Frequency	Percent
1	**To diversify teaching approaches**	19	47.6
2	For own future teaching reference	7	21.9
3	To share lesson plans with other teachers	2	6.3
4	For students' independent learning	7	21.9
5	To achieve lesson objectives	2	6.3

Nevertheless, although the result in Figure 8 indicated that the majority of respondents had developed some learning sites, the availability of many quality resources via other virtual learning platforms or social media applications became a barrier that possibly hindered the teachers in Avatar from actively developing their own learning sites. This was supported by the school administrator in Avatar who emphasised that,

> "Actually, we have many other alternatives, like the more accessible Tele (Telegram) group sharing. Teachers find that they can get a lot of quality materials there. The materials can be accessed in a shorter time, and easily downloaded if they find them useful. It's easier and faster than VLE. So, having that choice is sometimes an obstacle (to Frog VLE)" (School Administrator, 29th June 2018).

Likewise, the school administrator highlighted that although teachers in Avatar placed their effort in developing their own learning sites, there was a lack of quality in some of the educational contents. As a teacher herself, the school administrator believed that if it was not because of time constraint, the teachers in Avatar would have been able to produce better materials for the learning sites because they were knowledgeable in their respective subject areas. Hence, time was another first-order barrier that affected the teachers' involvement in resource development for their VLE learning sites. Further discussion regarding time will be included in 4.1.5.

(b) Utilisation in Other Areas

In Avatar, instead of depending on the traditional method using individual record book, since 2017 the teachers switched to utilising Frog VLE when submitting their lesson plans for endorsement from the school administrators. The weekly basis compulsory submission became a stepping-stone that saw an increase in

teachers' utilisation of Frog VLE. During the interview with the Senior Assistant, the researcher was informed that teachers in Avatar also used Frog VLE to assist them in other duties such as management of co-curricular activities as well as disseminating and compiling feedback forms for various school programmes.

4.1.5 School Highlights and Frog VLE Implementation Challenges

As a fully residential school, access to Frog VLE was not a major concern. Apart from the standard ICT equipment provided by the MoE, the school administrators in Avatar worked closely with the school's Parent Teacher Association (PTA) to get sponsorship for extra computers. The additional computers were connected to the school wifi and placed at the school café as well as along main corridors for the students' easy access. At the same time, adopting the MoE's 'Bring Your Own Device (BYOD) campaign, students in Avatar were also encouraged to bring and use their own iPads. However, usage of the students' personal iPads was restricted to only during school hours because when not in-use, the gadgets were kept in a designated room for security reasons. Thus, the availability of good ICT infrastructure provided by the MoE, the school and the students' personal gadgets allowed for more opportunities for teaching and learning to incorporate Frog VLE. Furthermore, in collaboration with the PTA, the school also employed some teachers to conduct ICT classes for the Form 1 and Form 2 students in order to guide them on how to optimise the features available in Frog VLE. Thus, students' familiarity with the VLE platform enabled them to comfortably do the homework or assignments given by their teachers.

One common challenge highlighted by the three teachers as well as the school administrator with regard to Frog VLE utilisation was time constraints. The

teachers had to spend a lot of time preparing the materials such as notes and quizzes prior to sharing them with the students via the teachers' learning sites. It included time taken to search for relevant information, develop questions and tasks, even when simply adapting from available resources. Time was also a challenge for the teachers when conducting lessons with Frog VLE integration in the classroom or the computer laboratory. Saleha recalled the time when one-period lesson for core subjects such as English was one hour, she felt comfortable integrating Frog VLE in teaching and learning. However, the time for one-period lesson had been standardised back to 35 minutes for all subjects. Hence, she believed that teachers including herself had to rush when delivering lessons with Frog VLE integration to suit the time limit.

The challenge escalated when occasionally the internet speed became slower. It resulted in longer time required for any online data transmissions and slowed the teaching and learning process. Nevertheless, Saleha and Amira believed that the issues did not discourage them from continuing to integrate Frog VLE in teaching and learning. Saleha highlighted that "It does not demotivate. It does refrain us from doing that (integrating Frog VLE)…it stopped us for a while, postponed or delayed us" (Saleha, 29th June 2018).

At the time this interview was conducted, Sheila was also Avatar's VLE coordinator. As the school's VLE coordinator, she described among her major challenges were mastering the skills to utilise the many features available in Frog VLE, getting more teachers especially the older generations to utilise the platform more often, and attending to some bureaucratic issues related to Frog VLE. In terms of skills, it was a challenge for Sheila because many times other teachers

in Avatar referred to her for some clarifications regarding certain applications or features in Frog VLE. Meanwhile, Saleha added that there were insufficient CPDs organised by the MoE. According to her, “Since this is an A-class school, maybe they’re (the MoE) hoping that the teachers will find out on their own” (Saleha, 29th June 2018).

In light of the situations, Sheila had to be proactive and find relevant sources that helped her gain better understanding of the platform in order to help other teachers in the school. Nevertheless, Sheila was also faced with time constraints whilst trying to find relevant information regarding the functions and how to utilise certain features on the VLE platform. Hence, Sheila enrolled the support from young teachers in every department in Avatar who had been asked to consistently explore and understand the features in Frog VLE. Subsequently, Sheila and the team of young teachers were ready to offer assistance to their colleagues who required help. Similarly, in order to encourage more teachers to utilise the VLE platform, Sheila organised CPDs for the teaching staff. However, she emphasised that not all teachers were keen to participate due to time factors.

When dealing with the Principal and other authorities at the district and state levels, a lot of emphasis was placed on achieving the KPIs for Frog VLE. It was claimed that there was less focus on helping the teachers grasp the necessary skills on how to use and integrate Frog VLE in teaching and learning. Sheila described the VLE utilisation culture in Avatar at approximately 60% due to the efforts to achieve the KPIs.

Referring to the ICT Integration model, the school administrator believed that in Avatar, there were teachers in every category. She highlighted that many of the young teachers in Avatar were seen as creative adapters because technology such as Frog VLE helped to ease their duties as teachers. This opinion echoed with the findings from the Spearman's Rank Order (rho) correlation test as indicated in 4.1.2 whereby the younger the teacher, there was higher tendency for them to utilise Frog VLE more often in their teaching and learning.

4.1.6 Summary of Findings for Avatar

In general, although access to Frog VLE in Avatar had been satisfactory, the extent of utilisation by the teachers was at a moderate level. Many of the participants in Avatar utilised Frog VLE to adhere to instructions from the MOE. The teachers felt obliged to abide by the instructions since Frog VLE was an expensive investment by the Ministry. Furthermore, they were also compelled to help the school achieve the VLE KPIs set by the Ministry. Nevertheless, the participants held positive beliefs regarding Frog VLE and its potentials for teaching and learning. In addition, students in Avatar liked to use Frog VLE as part of their learning experiences due to several factors as elaborated in section 4.1.3 (c).

The results in Avatar indicated that the positive beliefs and encouraging responses from students did not lead to higher Frog VLE utilisation by the teachers due to some first-order barriers such as perceived low integration skills including the competency to develop learning sites. Hence, the number of learning sites already developed were quite low in number and sometimes the contents were questionable in terms of quality.

Time was also a great challenge highlighted by the participants in Avatar. They reported experiencing time constraints in preparing materials, developing quality learning sites and during integration as part of the teaching and learning process in the classrooms. Furthermore, the participants also cited that time constraint prevented them from getting involved in relevant VLE CPDs to improve their skills. In Avatar, the younger the teacher, the higher the tendency for them to utilise the VLE more often for teaching and learning. Hence, the strategy of involving more young teachers in Avatar to explore the virtual learning platform and offer assistance to their colleagues was an alternative measure that yielded a favourable outcome. There was evidence from the survey that reported teachers received adequate assistance when having problems with Frog VLE.

In Avatar, utilisation of Frog VLE in teaching and learning predominantly occurred because the participants wanted to provide their students with additional resources for better understanding of topics. Furthermore, it was also typical for the participants in Avatar to test or enhance students' understanding of topics by conducting educational games and quizzes via the VLE platform. The educational games and quizzes helped the students to experience learning in a faster (to gain answers and feedback), fun and enjoyable process while the teachers were able to reduce the number of exercise books to mark or assignments to grade. Beyond the classroom teaching and learning process, teachers in Avatar also utilised Frog VLE to submit their lesson plans to the school administrators, as well as for management of co-curricular activities in the school.

4.2 Symfony

Symfony was a regular post-primary national school situated approximately seven kilometres from Shah Alam, the capital city of Selangor state. Although the school was near the capital city, Symfony was also located next to an industrial zone that was host to a large number of factories and warehouses. Student enrolments to Symfony were mostly from the surrounding areas. Hence, many of the students in Symfony came from low to middle income families. Symfony was a co-educational school adopting double school sessions (morning and afternoon) to cater for its 1,279 students. here were 83 teachers in Symfony excluding the school Principal and the senior assistants. Despite being a regular post-primary national school, students' intake in Symfony was based on good academic background during their primary school level. The students usually had scored at least 3As in their Year 6 (age 12 years old) examination at primary school level. In addition, the subject syllabi in Symfony emphasised on the Islamic Religious studies. Therefore, priority was given to students with Arabic language background to ensure smooth transitions from the primary to post-primary stage. There were hostel benefits provided in Symfony but the facility was limited to 400 underprivileged students based on specific criteria set by the MoE.

4.2.1 Participants' Demographic Information

There were 35 respondents who answered the teacher survey using the hardcopy version while 4 teachers responded online (39 respondents in total). The majority of respondents were female (37 teachers, 94.9%) and only 2 (5.1%) respondents were male teachers as represented in Figure 10. Statistics from the Selangor State Education Department indicated that at the time of data collection, there were 5,164 (80%) female teachers and 1,257 (20%) male teachers in post-

primary schools around Petaling Perdana district which was within Symfony's locality (Jabatan Pendidikan Negeri Selangor, n.d.).

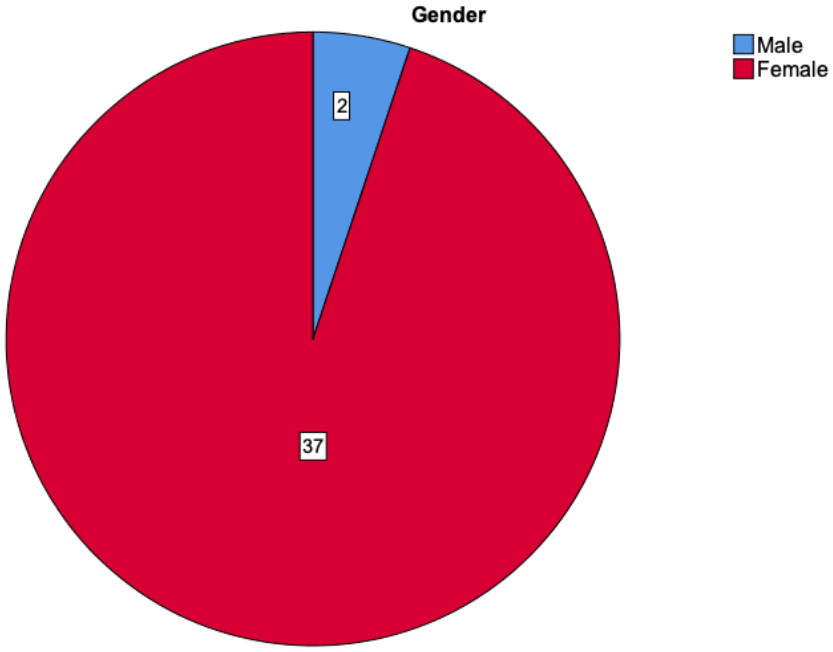


Figure 10: Respondents' Gender Distribution (Symfony).

The youngest respondent in the teacher survey was 25 years old and the oldest was 56 years old as indicated below.

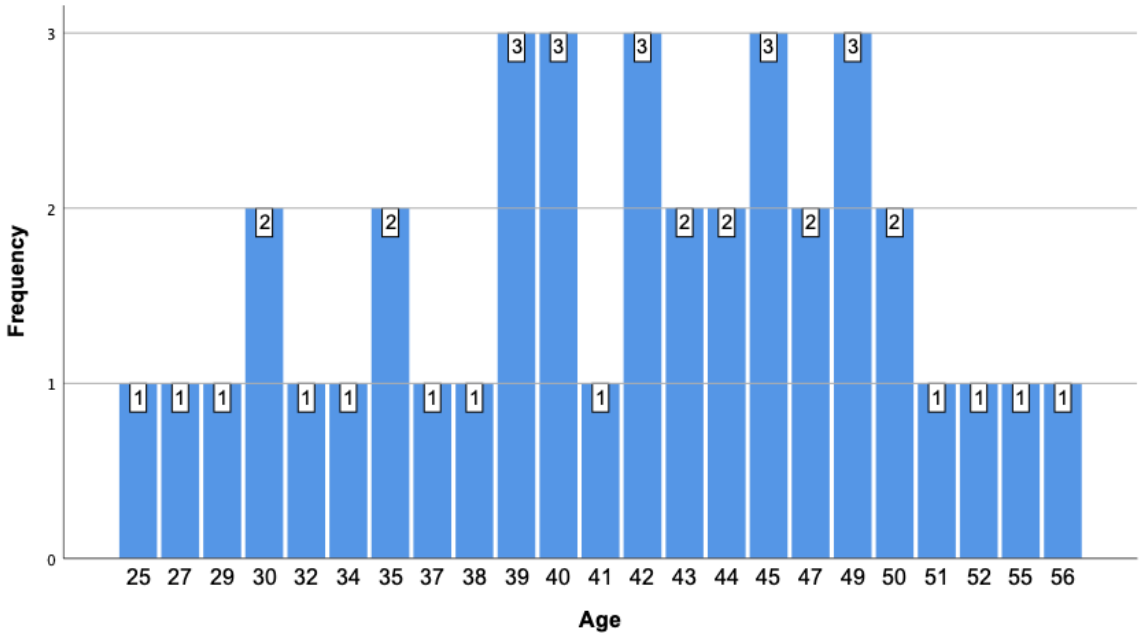


Figure 11: Respondents' Age Distribution (Symfony).

A summary of the subjects taught by the respondents is portrayed below.

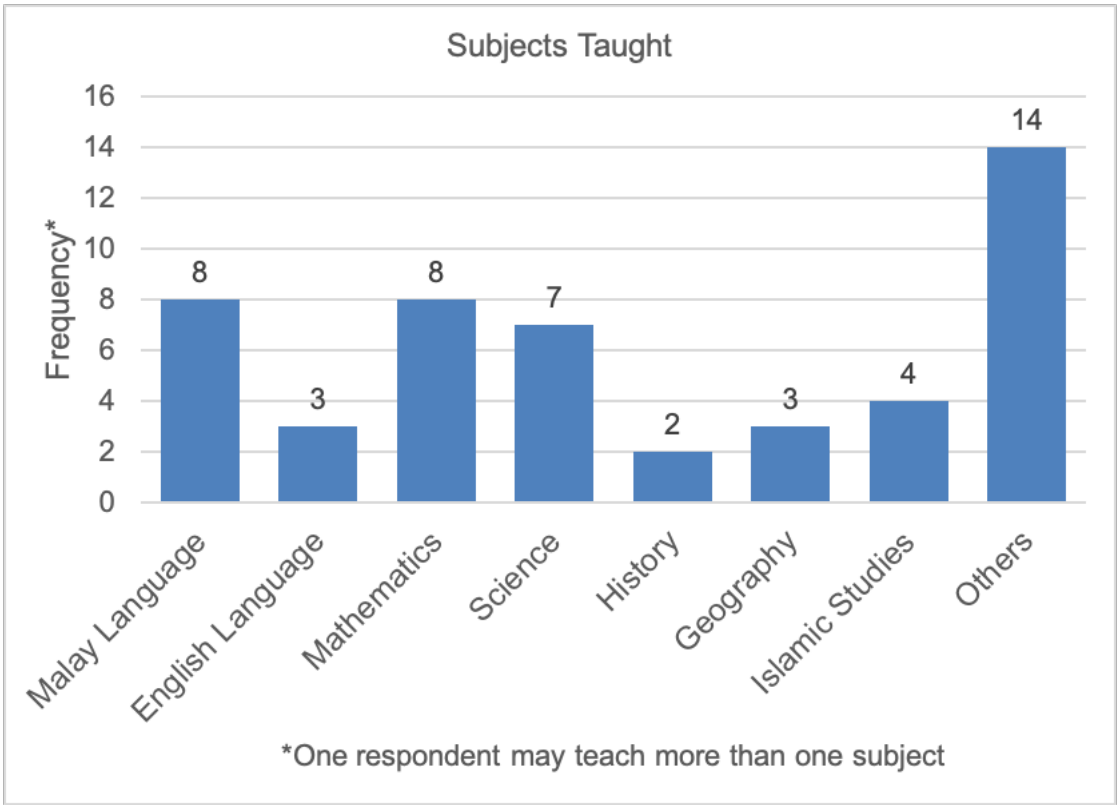


Figure 12: Subjects Taught by Respondents (Symfony).

In relation to experience with Frog VLE, the range of years varied from zero (0) or no experience at all to 6 years as displayed in Table 11.

Table 11: Year (s) of Experience Utilising Frog VLE (Symfony).

Number of Years	Frequency	Percent
0	1	2.6
1	7	17.9
2	7	17.9
3	11	28.2
4	3	7.7
5	9	23.1
6	1	2.6
Total	39	100.0

All three participants who took part in the interview sessions were female teachers. One teacher was in the thirties age group and the other two participants were in their forties. Table 12 displayed a summary of the three teachers' demographic information and pseudonyms used for this study.

Table 12: Symfony Teacher Pseudonyms and Demographic Information.

Teacher & Pseudonym	Gender	Age group	Years of teaching experience	Subjects taught in Symfony
Teacher 1: Kathy	Female	40s	17	Science, Mathematics, Chemistry
Teacher 2: Roslina	Female	40s	20	Geography, Malay language
Teacher 3: Bella	Female	30s	13	Design Technology (RBT), Graphic, Technical and Communication (GKT)

The three teachers were teaching classes both in the Lower Secondary (Forms 1 to 3) and Upper Secondary (Forms 4 and 5). Kathy taught Science and Mathematics to the Form 3 (15 years old) students. She also taught Mathematics and Chemistry to the Form 5 (17 years old) students. Meanwhile, Roslina taught Geography to the Form 3 and Form 5 students. As for the Malay language subject, her class comprised of the Form 2 (14 years old) students. Bella's RBT lessons involved the Lower Secondary students and for GKT subject, her students were from the Upper Form classes.

A total of 12 students in Symfony were interviewed regarding their experience with Frog VLE. Table 13 displays a summary of the demographic information and pseudonyms of the students.

Table 13: Demographic information and pseudonyms of Symfony students involved in the interview sessions.

Student Group Number	Age & Class / Level	Gender	Count	Pseudonyms
One	15 years old, Form 3	Boys	0	-
		Girls	4	Fauza, Aini, Nadine, Siti
Two	16 years old, Form 4	Boys	2	Abdul, Dafi
		Girls	2	Kemmy, Diana
Three	17 years old, Form 5	Boys	1	Rahmat
		Girls	3	Fatimah, Azreen, Sue
Total number of students			12 students (3 boys, 9 girls)	

4.2.2 Teachers' Actual Utilisation of Frog VLE for Teaching and Learning

(a) Frequency of Integration

Based on the survey conducted in Symfony, the majority of respondents (25 teachers, 64.1%) reported that integration of Frog VLE for teaching and learning with students occurred once a month. Only 4 respondents (10.3%) indicated that the utilisation of Frog VLE occurred between 3 to 5 times per month. However, there were still 10 respondents (25.6%) in Symfony who had never integrated Frog VLE in the lessons they conducted with their students. The detailed results are presented in Figure 14.

The majority of respondents in Symfony were those teaching core subjects such as Malay language, Mathematics and Science (refer Figure 13). The statement in the questionnaire required the teachers to make reference to any one particular class that they were teaching in Symfony when indicating the frequency of Frog VLE integration. Hence, based on the TALIS average of 17 teaching hours per week for Malaysian teachers, it was possible that a respondent who utilised Frog VLE once a month for teaching and learning was actually integrating the VLE

platform between 4 to 6 times per month with all the taught classes. Therefore, the actual utilisation of Frog VLE for teaching and learning as reported by the respondents in Symfony was at a moderate level.

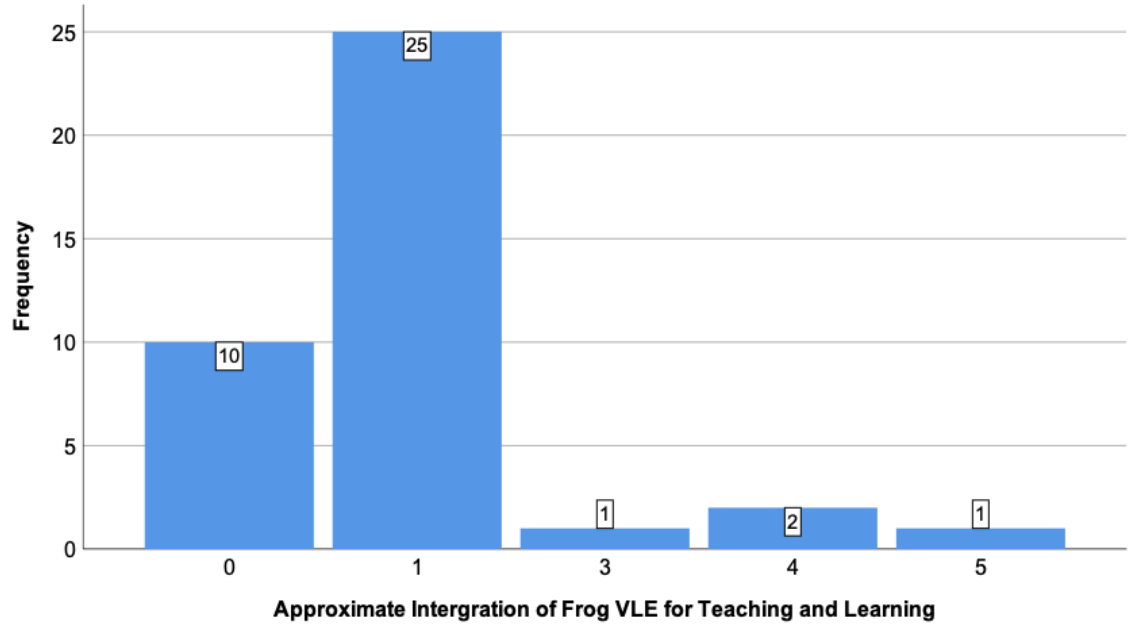


Figure 13: Approximate Integration of Frog VLE for Teaching and Learning in Symfony (per month).

The result from Spearman's Rank Order (rho) correlation test between age and actual Frog VLE utilisation yielded an r_s = -.262 and p > 0.01. The correlation coefficient (r_s) value indicated a negative relation, to suggest that the younger the respondents' age, the higher the utilisation of Frog VLE. However, the amount of -.262 suggested only a weak correlation, depending on the result of the Sig. (p-value). Since the p-value was higher than 0.01, there was generally no evidence to correlate between age and actual Frog VLE utilisation among the respondents in Symfony. In other words, age did not contribute much to the extent of actual Frog VLE utilisation among the respondents in Symfony.

(b) Utilisation of Specific Features in Frog VLE

The results in Table 14 suggested that respondents in Symfony mostly used the platform to assign homework to their students. The 'assign homework' attribute scored the highest mean (1.08) among the list of Frog VLE features included during the survey. Although the 'assign homework' feature had the highest mean score, only 19 teachers (48.7%) indicated that they only assigned homework to their students via Frog VLE once a month with every class that they were teaching. A similar number of respondents (18 teachers, 46.2%) never utilised the feature at all.

The survey results also suggested that the features enabling communication to occur via Frog VLE were least utilised by the respondents. For instance, in terms of teacher-student communication, 20 respondents (51.3%) indicated that they never utilised Frog VLE to communicate with their students. As presented in Table 14, 25 respondents (64.1%) admitted that they never gave feedback about homework to students through the platform. Even more respondents (33 teachers, 84.6%) disclosed that they never used Frog VLE to communicate with the students' parents.

Table 14: The results for actual utilisation of specific features available in Frog VLE.

No.	Survey Item	Never		Once a month		Once a week		More than once a week		Mean
		f	%	f	%	f	%	f	%	
1	**Teacher assigns homework to students**	18	46.2	**19**	48.7	1	2.6	1	2.6	**1.08**
2	Teacher utilises Frog VLE to give feedback to students about homework	25	64.1	13	33.3	1	2.6	0	0	0.69
3	Teacher communicates with students' parents via Frog VLE	33	84.6	3	7.7	3	7.7	0	0	0.23

Legend: f (frequency), % (percentage).

(c) Application of Frog VLE for Teaching and Learning in Symfony

The results from a cross-tabulation analysis between gender, age groups and main purpose for Frog VLE utilisation revealed that in general, the respondents in Symfony integrated Frog VLE in teaching and learning to provide their students with supplementary resources in order to enhance understanding of topics (refer item (i) in Table 15). Kathy and Bella were two examples of teachers in Symfony who frequently utilised Frog VLE to share notes after class sessions for the students' reference. According to Kathy (6th June 2018), "If I use PowerPoint slides during teaching, I usually upload the slides as notes or supplements so that it's easier for the students to recap or refer especially before their exams". Roslina adopted a slightly different approach than Kathy and Bella in her application of Frog VLE with her students. Although she also mainly utilised Frog VLE to provide supplementary resources, Roslina preferred to furnish her students with links to relevant websites rather than uploading lesson notes.

Roslina believed that her students were independent learners. Thus, her students were able to make their own notes based on information they read via Frog VLE or learnt in the classroom.

Based on Table 15, there were 13 respondents (33.3%) who had chosen the reason of providing additional resources to students while the second highest reason (9 respondents, 23.1%) was related to the option of testing students' understanding in addition to utilising the platform for additional resources. Meanwhile, only 8 respondents (20.5%) selected reasons that encouraged 21st century teaching and learning concepts such as fostering group collaborations, expressing opinions, discovering and presenting new ideas.

Referring back to Roslina's approach of providing additional resources in the form of links to relevant websites, her students had better opportunities to further explore topics and exercise 21st century teaching and learning activities. The researcher had the opportunity to observe Roslina's Geography lesson with her Form 3 students. There was evidence of Frog VLE being utilised to foster group tasks. Students explored the world wide web in a safe educational context via Frog VLE. The students also utilised Frog VLE as the medium to present information they gathered and share their group findings. Roslina was an example of a creative adapter based on the Teacher ICT Integration model developed by Donnelly et al. (2011). A creative adapter is a teacher who is able to utilise relevant educational resources, practises the teacher's role as a facilitator in class and maintaining student-centred learning approaches. During the interview, Roslina shared the following opinion regarding her approach to Frog VLE integration;

> "Since information on the internet is unlimited, I would like to train the students to explore...There is so much that if we only teach through theory from the book, the students won't be able to 'see' what geography is! Although they could find plenty of information, they might not be able to present it well as their knowledge is limited. This is where the teacher's role as a facilitator is vital, to help and explain or add more on what the students could not previously understand from the information they gathered from the internet" (Roslina, 6th June 2018).

In relation to age, as indicated from the Spearman's Rank Order (rho) correlation test result described earlier in 4.2.2 (a), there was no evidence to correlate between age and actual Frog VLE utilisation among the respondents in Symfony. The result in Table 15 also suggested a similar finding to the Spearman's test. It was difficult to associate a clear pattern of answers with regard to the main purpose of Frog VLE integration selected by respondents from the age groups.

Table 15: Cross-tabulation analysis between gender, age groups and their main purpose for integration of Frog VLE (Symfony).

Age groups	Gender	Not applicable	(i) To provide additional resources	(ii) To provide additional resources and test students' understanding	(iii) To allow students to further explore topics and express opinions (discussions & debates)	(iv) To allow students for further exploration of topics, collaborate in groups and present new discoveries	Total
20s	Male	0	0	0	0	1	1
	Female	1	1	0	0	0	2
30s	Male	0	0	0	0	0	0
	Female	1	3	3	3	1	11
40s	Male	0	1	0	0	0	1
	Female	5	6	4	2	1	18
50s	Male	0	0	0	0	0	0
	Female	2	2	2	0	0	6
Total		9	**13**	9	5	3	39

Only the 50s age group had zero respondents selecting options related with the 21st century teaching and learning concepts (labeled (iii) and (iv) in Table 15). They were more inclined to integrate Frog VLE in the traditional, teacher-focused and content-oriented approach as emphasised by Lameras, Levy, Paraskakis and Webber (2012) when describing the four categories of VLE use (outlined in Table 15 via labels i, ii, iii and iv). Responses from the 30s and 40s age groups represented all categories of VLE use while the respondents for the 20s age group were too few (only 3 teachers).

4.2.3 Teachers' Frog VLE Utilisation Factors

(a) Suitability for The Education System

Findings from the teacher survey in Symfony revealed that 24 respondents (61.5%) believed Frog VLE was capable of supporting the implementation of the education system such as the curriculum and syllabus. Analysis from the teachers' interview sessions also highlighted a similar opinion. For example, Bella described that for her Graphic, Communication and Technical (GKT) subject, the students' assessments comprised of Part A and Part B. In Part A, the students had to answer questions related with theories in GKT while Part B involved practical work. Hence, according to Bella,

> "Frog VLE is extremely suitable for Part A. The Form 4 GKT textbook is not for regular loan for the students. It can be used only as reference and has to be returned immediately after each use. However, exam questions in Form 5 also include Form 4 topics. So, I uploaded relevant notes via Frog VLE. Students utilise Frog VLE to do their revision. I think it's not suitable to use Frog for Part B because it involves practical work. Nonetheless, there are PowerPoint or slides in Frog VLE that provide step-by-step guidance for students' preparation for the practical work" (Bella, 27th June 2018).

Roslina also agreed that Frog VLE integration was suitable for the Geography subject. She highlighted that based on the ongoing curriculum, Geography provided opportunities for students to explore and learn more, for instance about the dynamics of human population, places, natural resources and climate changes. Students' assessments for Geography involved two parts comprising of a school-based individual project work and a summative written examination. She recalled that in one of the previous year's assessment, the theme for the individual project work was related to community. One of the tasks required the students to identify a community of their choice and based on Google Maps, they had to draw the location for that particular community. "Where can students locate Google Map? The internet of course! So basically, students logged in to their Frog VLE accounts, accessed Google Maps, captured the required information and saved all work in their accounts" (Roslina, 6th June 2018). Hence, this emphasised the suitability and importance of the VLE integration in supporting the curricula and assessments.

(b) Teacher-related Factors

Kathy indicated that integration of Frog VLE also depended on the teacher's pedagogical approach. In situations whereby the topics to be taught were suitable for class activities based on 21st century pedagogy, students typically utilised Frog VLE to access information in order to complete their group tasks. Apart from that, utilisation of Frog VLE was optimised as the students prepare and share their presentation slides with the whole class. This was evident when the researcher had the opportunity to observe Roslina's Geography class. During the class session, the students were given some time to finalise their group discussions which had already begun prior to the lesson. Frog VLE was utilised

as the medium to share materials and for each group to display their presentations to the whole class. Roslina provided assistance to the groups during discussions and gave feedback to the students' presentations.

Referring to the Interconnected Model of Teacher Professional Growth, Clarke and Hollingsworth (2002) suggest that teacher change partly occurs because teachers have experienced or observed salient outcomes from an implementation or experimentation of activities. The salient outcomes comprised of various forms including teacher satisfaction, teacher planning effectiveness and increased student learning. In Symfony, Roslina claimed that her role as a teacher became much easier with Frog VLE integration. Previously, when teaching for example the concept of volcanic eruption, Roslina described that she spent extra time and effort to search for relevant videos from the internet, saved them using her USB flash drive and showed the videos to her students in class. Roslina spent her time and effort in order to help her students visualise the process and gain better understanding of the topic.

However, with Frog VLE, it was easier for Roslina because with proper instructions and guidance, her students explored the internet to search for the relevant information and videos themselves. With the VLE, Roslina's students were assigned in groups to search for different stages of the volcanic eruption process. The information gathered as well as all group presentation materials were shared by the students via Frog VLE. Hence, in this example, there were more active participation and collaboration not only among students but also between the teacher and the students.

The ability to provide cloud storage in Frog VLE was one of the benefits that attracted Bella and Kathy to actively utilise the platform. Bella expressed that Frog VLE became her favourite 'thumb drive' or flash drive because she stored all her teaching and learning materials in its cloud storage. Meanwhile, Kathy enjoyed the benefit of cloud storage in Frog VLE because she compiled Mathematics questions that she developed or adapted from other resources. The compilation of questions was shared with her students and later re-used with her classes in future. Furthermore, according to Kathy, utilising the cloud storage in Frog VLE helped to save physical storage space by reducing the use of papers.

With regard to the opinions from other teachers in Symfony, the teacher survey revealed that 24 respondents (61.5%) felt more motivated to utilise Frog VLE for teaching and learning after they had seen the benefits or evidence of salient outcomes. In addition, 17 respondents (53.6%) indicated that they felt more motivated to utilise Frog VLE with some encouragements from the school administrators. This occurred because findings from the teacher survey also revealed that most of the respondents (21 teachers, 53.8%) admitted to utilising Frog VLE because of instructions from their superiors and the MoE. Hence, external support from the school administrators provided a source of motivation for the teachers.

During the interview, Kathy described that when she started utilising Frog VLE in Symfony, it was to adhere to the instruction from the school administrators. According to her, "I am not a computer kind-of-person. I was in charge of exams and one day was instructed to attend an ICT programme together with the school's ICT teacher...starting from that, I began to be directly involved with all

ICT programmes in Symfony" (Kathy, 6th June 2018). However, after several years of getting involved in Frog VLE programmes, CPDs and actively using the platform, Kathy emphasised that utilisation of the VLE became a norm for her. Besides, she had already seen and experienced some of the benefits of Frog VLE utilisation, particularly with regard to the cloud storage facility that enabled her to efficiently keep and retrieve her educational resources.

The results associated with salient outcomes and support from administrators were in accordance with the theory from the Interconnected Model of Teacher Professional Growth. Based on the model, the support from school administrators as well as information and stimulus (such as the CPDs and letter of instruction from the MoE) were examples external domain. Inputs associated with the external domain affected other domains in the teachers' change environment. For instance, information gathered from Frog VLE programmes helped to increase Kathy's knowledge (personal domain) regarding the platform. The knowledge (personal domain) and stimulus (external domain) led Kathy to conduct her own professional experimentation (domain of practice) regarding the utilisation of Frog VLE. The results from the experimentation produced salient outcomes (domain of consequence) that in return affected Kathy's belief (personal domain) regarding Frog VLE utilisation. As described earlier, Kathy was happy that the cloud storage in Frog VLE enabled her to compile her teaching and learning materials more effectively. Furthermore, she was able to reduce paper consumption and save space for physical storage. Therefore, Kathy's current Frog VLE utilisation was not entirely due to adherence to instruction but also because of changes in the other factors related with the different domains.

Roslina and Bella explained that they utilised Frog VLE mainly due to personal interest and self-motivation. From the beginning, both teachers saw the potential benefits of Frog VLE for themselves as teachers as well as for the students. Their interest and motivation to utilise Frog VLE increased after personally experiencing the benefits from integration during teaching and learning sessions with their students. Nonetheless, Bella described that during the earlier utilisation stage, she spent some time searching for online tutorials such as from Youtube on how to use particular functions in Frog VLE. This was because although Bella was in her 30s and had always been interested in ICT, she struggled to understand how to operate certain functions even after attending a few CPD sessions. She emphasised,

> "If only Frog itself is not so…less user-friendly. Well it's a little bit tedious. There are a few steps to do when using the widgets. I'm not trying to say bad things but it's difficult especially for the senior teachers. They wanted to utilise the slides widget and trying to prepare one slide…yet there were several steps that they had to do." (Bella, 27th June 2018).

On that note, the survey revealed that in terms of the teachers' self-assessment on Frog VLE general utilisation skill, 34 respondents (87.2%) categorised themselves as having between low to advanced levels of competency. Nevertheless, the majority of respondents in Symfony (23 respondents, 59%) rated themselves as having low skill level. Five respondents (12.8%) believed that they had no skill at all. Results from the survey indicated that only 12 respondents (30.8%) regarded that they received sufficient CPDs on how to integrate Frog VLE for teaching and learning. Although only 10 respondents (25.6%) recorded either 'disagree' or 'strongly disagree' as their answers, as many as 17 respondents (43.6%) decided to remain neutral or unsure whether to agree or disagree with the statement about the adequacy of CPD sessions.

Meanwhile, there were two stages of utilisation factor in association with time. The first stage was insufficient time during the preparation of lessons, including time constraints in finding, developing or adapting suitable resources to suit the students' learning. Based on the teacher survey, 16 respondents (41.1%) specified that they did not have enough time at preparation stage (see Table 16).

Table 16: Result for statement 'I have enough time to prepare lessons that integrate VLE' (Symfony).

Responses	Frequency	Percent
Strongly disagree	4	10.3
Disagree	12	30.8
Not sure	15	38.5
Agree	8	20.5
Strongly agree	0	0
Total	39	100.0

The second stage of time factor was during the implementation of lessons that integrated Frog VLE. A total of 17 respondents (43.6%) were 'not sure' whether to agree or disagree with the statement in the teacher survey that suggested they had adequate time to implement lessons with Frog VLE integration. For this statement, 14 respondents (35.9%) emphasised that they did not have sufficient time while the remaining 8 respondents (20.5%) recorded no issue. Based on analysis from the teacher interviews, all three teachers indicated that they experienced time constraint especially at the preparation stage. Nonetheless, the teachers did not consider the time constraint as a major barrier that hindered them from utilising Frog VLE in teaching and learning. Bella and Kathy explained that the difficult part was at the beginning stage when they had to spend extra time to develop and compile their educational materials in Frog VLE. However,

both Bella and Kathy believed that once teachers had their own compilation of resources, the VLE actually helped to save their time.

(c) Student-related Factors

Roslina explained that before the introduction of Frog VLE, students usually arranged for a meet-up at the school canteen to discuss their group assignments. Meanwhile, all discussion materials were kept on papers or saved on gadgets such as a USB flash drive. However, with Frog VLE, it was not necessary for students to physically meet each other for discussions. Instructions and materials were shared via Frog VLE and easily accessible as long as there was internet connectivity. Nadine, one of Roslina's students highlighted that group assignments became easier with Frog VLE because students did not always need to set time and place to meet for discussions.

Based on Table 17, some other students in Symfony also shared the same opinion regarding the benefits of Frog VLE utilisation for students' group work (see item 1). Fauza and Nadine added that when teachers in Symfony encouraged students to do group presentations by utilising Frog VLE, there were more opportunities for the students to include detailed elaborations of the topics assigned to them. Previously when students had to use flipchart papers to note down their presentations, they had the limitation of space to write important points or ideas. As a result, sometimes the students forgot to highlight particular points during presentations or other students possibly did not get sufficient information regarding the topic. With Frog VLE utilisation, students were able to embed videos and external links to websites that were useful to support their presentation topics. Besides, flipchart papers were typically thrown away after

presentations but the materials on the VLE were accessible at anytime for every student in the class. According to Fauza (6th June 2018), “If any of our friends was absent, he or she could also access the presentation materials via Frog VLE. So, it’ll be equal. If we got this much information, our friends would get the same too”.

Table 17: Symfony Students’ reasons for enjoying the utilisation of Frog VLE.

Item	Reasons	Students
1	**Easier to do and share materials for group work and students’ presentations**	Fatimah, Sue, Azreen, Dafi, Fauza, Aini, Nadine
2	**Easier to ask questions**	Dafi, Diana, Abdul, Kemmy, Aini, Nadine
3	Easy reference to textbooks (audio and visual references)	Abdul, Diana, Rahmat, Azreen
4	Not boring, provided fun alternative in doing revision (i.e. via FrogPlay, The Pond)	Kemmy, Fauza
5	Reference to notes, teachers’ presentations and other study materials	Dafi, Kemmy
6	Reduced usage of papers	Kemmy, Sue, Azreen, Fauza
7	Improved ICT skills and preparation for university/work life	Rahmat, Azreen
8	Cloud storage (eased management of educational materials, safe storage)	Sue, Fauza, Aini

In addition, some of the students in Symfony believed that since utilising Frog VLE, they had better opportunities and felt more confident to ask questions to their teachers (item 2 in Table 17). According to Dafi, Diana and Kemmy, they did not know their subject teachers’ mobile-phone numbers. Hence, when doing assignments or revisions after school hours, the students were able to email their teachers if they had any questions. Each teacher’s email addresses were available on the learning sites in Frog VLE. Although the teachers sometimes

responded to their questions via Frog VLE, most of the times feedback to the students' questions were given by the teachers during face-to-face interactions in the classroom. This input from the students supported the findings from the teacher survey that indicated Frog VLE was less utilised by the teachers to give feedback to students (see Table 14).

Based on the teacher survey, 24 respondents (61.5%) agreed that integration of VLE helped to develop useful skills for students to use in their daily life and future. Rahmat and Azreen were two examples of students who believed Frog VLE utilisation and integration in teaching and learning had helped them to be better prepared for their future. They were happy to gain more familiarity and confidence in using technology in education to search for information, explore ideas, collaborate in group work and share educational materials with their teachers and classmates. Both Rahmat and Azreen were aware that ICT had been widely utilised for education at tertiary level as well as in the work force. Hence, being familiar and comfortable with Frog VLE at post-primary level served as preparation for them to experience further integration of ICT either in tertiary education or for their future career (see item 7 in Table 17).

With regard to students' access to Frog VLE, Bella and Roslina were confident that the majority of their students had no problems accessing the learning platform outside the school compound. According to Roslina, her students owned mobile phones with data plan (internet access). Besides that, students were also able to gain access to Frog VLE from cybercafés or internet facilities in the local community centres provided by the government. Nonetheless, Roslina were aware that a few of her students who stayed in the hostel did not have internet

access when they went home during school holidays. Hence, these students usually capitalised on the facilities in the school's computer laboratory before the school term ended. Indeed, the majority of the students interviewed expressed no problems with accessing Frog VLE outside the school compound.

4.2.4 Further Utilisation of Frog VLE for Teachers' Professional Practice

(a) Development of The Teachers' Learning Sites

Based on the survey in Symfony, most of the respondents (19 teachers, 48.7%) regarded themselves as having low skill level in relation to development of their own learning sites. Referring to Figure 14, a total of 8 respondents (20.5%) indicated that they had no skill at all.

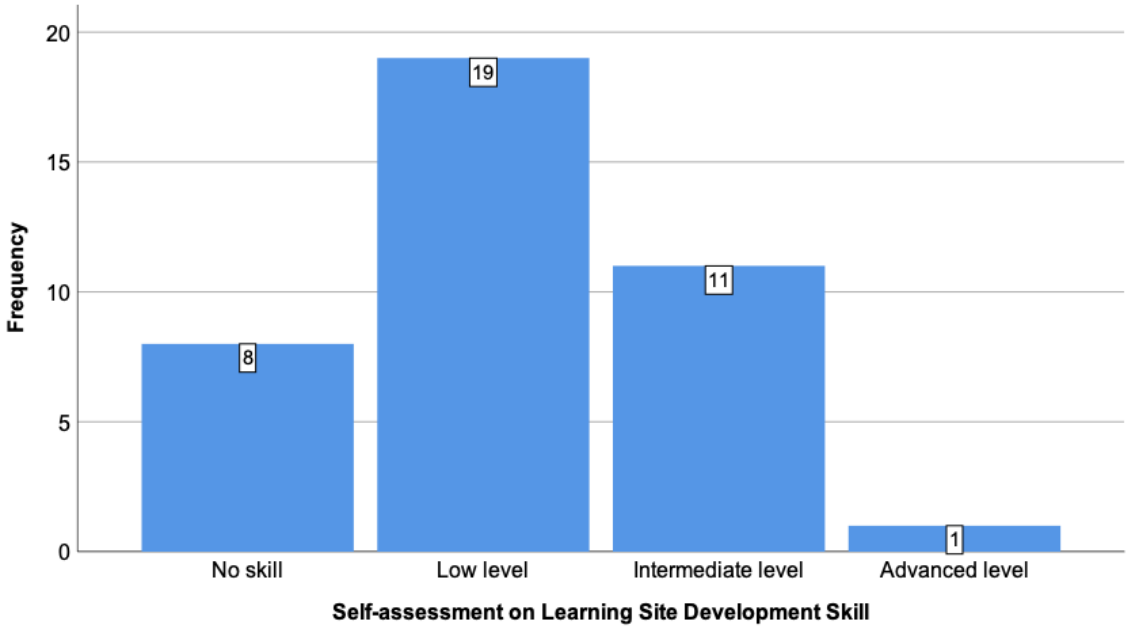


Figure 14: Symfony Teachers' Self-assessment on Learning Site Development Skill.

As portrayed in Figure 15, the majority of respondents (26 teachers, 66.7%) reported that at the time the survey was conducted they had developed between only 1 to 10 learning sites in Frog VLE. Meanwhile, there were 9 respondents

(23.1%) who revealed that they had developed zero (0) learning site. Thus, the result demonstrated that in Symfony, the extent of teachers' involvement in learning site development for Frog VLE was between low to moderate level.

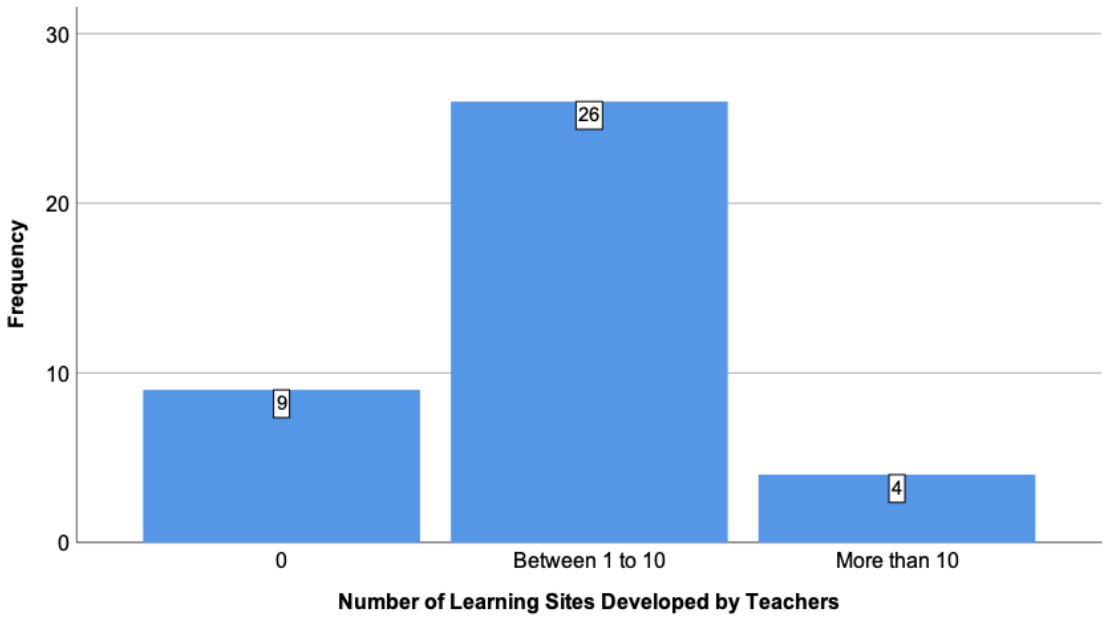


Figure 15: Learning Site Development (Symfony).

Comparing the results between Figure 14 and Figure 15, there was a slight difference between the number of respondents who reported that they had no skill and those who declared that they had never developed any learning site in Frog VLE. The difference in number between the total respondent who self-assessed themselves as having no skill (8 teachers) and those who confessed that they had never developed any learning site (9 teachers) suggested that apart from skill level, there were potentially other factors hindering the teachers from developing learning sites in Frog VLE.

Analysis from the interview sessions with the teachers suggested that among the potentially contributing factors were time constraint and teachers' workload. Although Roslina had developed some learning sites, she indicated that her sites

were seldom updated because at school she was already occupied with her teaching hours as well as her other duties as a teacher. Roslina added that when she went home, she mostly focused on spending her time with family. Bella also detailed that she only updated her learning site occasionally. She informed the researcher that she only did a general layout of her learning site at the beginning stage of her Frog VLE utilisation. From time to time she updated the same learning site by uploading more materials such as notes and links to other relevant resources. Bella also attributed her lack of enthusiasm to create a new learning site or regularly updating the present site due to the perceived non user-friendly nature of the Frog VLE platform. As described in the earlier section, there were several phases that teachers had to complete even if they only wanted to upload materials. Bella described that some phases involved in the learning site development process were almost like coding steps. According to her,

> "For uploading materials, if only it can be done faster and easier! That would enable teachers to feel excited and happy. When it is less user-friendly, teachers don't really want to explore it. Then…with line or connectivity problems…I sometimes use my own internet line if I want to settle my task faster" (Bella, 27th June 2018).

Based on Bella's input as above, she highlighted not only issues regarding user-friendliness of Frog VLE but also internet connectivity problems. Further discussions regarding internet connectivity will be elaborated in section 4.2.5. Similarly, Kathy emphasised that nowadays with other options offered by social media applications such as Telegram, teachers in Symfony preferred to share educational resources using these alternative means because of convenience.

With regard to the learning site development widgets available in Frog VLE, results from the teacher survey showed that the respondents in Symfony most

commonly used the ‘media’ as well as the ‘external link’ widgets (31 respondents, 79.6% responses for each widget). In contrast, the forum widget that was part of the communication features in Frog VLE was least utilised by the respondents (18 respondents, 46.2%). This further highlighted the earlier findings regarding lack of utilisation of Frog VLE for communication purpose as elaborated in 4.2.2 (b) and 4.2.3 (c).

The result in terms of the adequacy of CPD sessions specifically on how to develop learning sites was quite similar with the result regarding CPD conducted to assist general utilisation of Frog VLE. Most of the respondents (15 teachers, 38.4%) were ‘not sure’ while 12 respondents (30.8%) reported that there were not enough CPD sessions regarding learning site development. Another 12 respondents (30.8%) indicated that they were satisfied with the number of learning site development-related CPD sessions conducted in Symfony.

Based on Table 18, the main reason behind the involvement of the respondents in developing learning sites was for them to diversify teaching approaches. Meanwhile, the second highest reason was to cater for students’ independent learning. The least popular reason chosen by the respondents in Symfony was for item number 3 (to share lesson plans with other teachers).

Table 18: Reasons for Learning Site Development (Symfony).

No.	Reasons	Frequency	Percent
1	**To diversify teaching approaches**	20	51.3
2	For own future teaching reference	11	28.2
3	To share lesson plans with other teachers	7	17.9
4	For students’ independent learning	14	35.9
5	To achieve lesson objectives	10	25.6

(b) Utilisation in Other Areas

Apart from being utilised for teaching and learning, Frog VLE was also used in Symfony for other non-academic purposes. For example, it was used to manage students' co-curricular activities from clubs and societies to the school's annual sports event. Kathy who was also one of the ICT coordinators in Symfony highlighted that Frog VLE helped to improve the efficiency of approximately 70% of management procedures especially involving registrations, feedback and reports. Nadine, the student from Group 1 gave an example whereby every year, Frog VLE was utilised to advertise vacancy positions for school and library prefects. Applications from students and all related announcements were conducted via Frog VLE. Kathy added that the school administrators in Symfony encouraged all disseminations of information to utilise Frog VLE, because teachers and students knew how to access the platform. Besides, it was also a means to encourage logins and improve the school's rating in relation to the VLE KPIs because one of the rating criteria depended on the frequency of user logins.

4.2.5 School Highlights and Frog VLE Implementation Challenges

In order to assist teachers and students with regard to Frog VLE utilisation, the coordinators in Symfony formed a group of experts called the Frog Champions. These Frog Champions consisted of students in Symfony who had been exposed to every feature available on the VLE platform and how to utilise them. Every teacher in Symfony had a designated Frog Champion assigned to help the teacher to be more familiar with the features and how to utilise Frog VLE for teaching and learning. Roslina, Bella and the senior assistant praised the idea of having the Frog Champions. Teachers might have some ideas on how to conduct lessons or knew the types of materials to prepare as teaching aids. However, the

teachers might not know how to utilise the widgets in Frog VLE in order to produce the lesson materials. As highlighted by the senior assistant, “The Frog Champions are already competent, it’s usually the teachers who are a bit slow” (Senior Assistant, 27th June 2018).

Hence, with Frog Champions, the teachers had more opportunities for personal one-to-one coaching on how to utilise features in Frog VLE. Bella and the senior assistant emphasised that during other CPD sessions, sometimes the teachers were not able to receive personalised attention from the trainers due to the large number of participants or time constraint. Therefore, besides forming the Frog Champions as part of the solutions to this problem, the senior assistant also emphasised that recent CPD sessions in Symfony had begun to focus on the teachers in smaller groups based on their Frog VLE competence levels.

The school also gave recognition to teachers and students who were frequent users of Frog VLE. Fauza, a student from Group 1 informed that she once received a USB flash drive as the prize for being one of the most frequent users of Frog VLE amongst the students. The senior assistant revealed that he had also recently been recognised as one of the most frequent users of Frog VLE amongst the teachers and administrators. However, the senior assistant indicated that for several years, it had been the same teachers who were active users of Frog VLE in Symfony. The school had identified that one of the main problems was the teachers’ inability to utilise the features of Frog VLE for teaching and learning. Therefore, the school began to conduct CPD sessions in smaller groups according to skill levels and formed the Frog Champions as elaborated earlier.

The result from the survey in Symfony also demonstrated further weakness associated with other first-order barriers. For instance, only 11 respondents (28.2%) had the opinion that the number of ICT equipment in good working condition were adequate to support teaching and learning with Frog VLE. The remaining 28 respondents (71.8%) held various opinions from 'strongly disagree' (10 teachers, 25.6%), 'disagree' (6 teachers, 15.4%) to 'not sure' (12 teachers, 30.8%). An analysis of the teachers' and administrator's comments regarding ICT infrastructure in Symfony provided further details regarding this issue. The senior assistant described that the computer laboratory building consisted of two levels (ground floor and first floor). The rooms on the first floor used to have desktop computers that were also connected to the internet. However, the desktop computers were already not in good working conditions due to a lack of maintenance. Thus, in order to conduct classroom teaching and learning sessions that integrated Frog VLE, students and teachers had to depend mostly on the Chromebook computers that were available on the ground floor.

With only one functioning computer laboratory, Roslina found it troublesome as teachers often had to book the room early in advance. According to her, "There are a lot of classes but there's only one lab, so we (teachers) had to 'fight' for it. Need to book early." (Roslina, 6th June 2018). Nonetheless, the senior assistant highlighted that there were some teachers in Symfony who were proactive in supporting the agenda of teaching and learning with the integration of Frog VLE or ICT in general: "Symfony is one of the schools that I can see teachers bring laptops… bring projectors everywhere. There are some teachers who bring wheelie bags to school… inside are their own laptop and projector… In Symfony,

these teachers bought their own laptop and projector and bring them to class" (Senior Assistant, 27th June 2018). The senior assistant's input regarding the proactive teachers' actions were reflective of the teachers' supportive attitude towards Frog VLE integration for teaching and learning.

Meanwhile, results from the teacher survey showed that 10 respondents (25.6%) perceived there was good internet connectivity in Symfony to enable access to Frog VLE. However, in relation to the statement in the survey, 'There is good internet connectivity in the school to enable access to Frog VLE', 8 respondents indicated that they strongly disagreed (20.5%), 9 respondents disagreed (23.1%) and 12 respondents (30.8%) were 'not sure'. Findings from the interviews with the teachers and senior assistant echoed this survey result regarding dissatisfaction associated with internet connectivity in Symfony. For instance, Bella described that whenever the internet connectivity was slow, it was a problem to access Frog VLE. Sometimes when Bella planned to access Frog VLE during her set induction phase in the classroom, the internet was slow until she ran out of class time. "I felt it slowed the teaching and learning process" (Bella, 27th June 2018).

The senior assistant explained that at the time the interview took place, the vendor appointed by the MOE had just upgraded that internet connectivity. However, according to him,

> "… some places do not get the internet signal. In this office (administration building), it is stronger, but at other places it's lost. There's no more line (internet) in the library. This recent one (the upgraded wireless device) is not properly reaching out, you see… but I've already discussed with the ICT coordinator to figure out how to do about it" (Senior Assistant, 27th June 2018).

The senior assistant shared with the researcher another challenge he faced with regard to Frog VLE implementation in Symfony. He revealed that there were teachers in Symfony who used the school's wifi internet connection for personal activities such as Facebook logins and online shopping. Hence, the internet connectivity provided by the school became slow. Previously, the administrators in Symfony collaborated with the ICT coordinator to investigate the reasons for teachers indicating they had insufficient time to integrate Frog VLE in teaching and learning. Their investigation found that insufficient time which was also discussed in 4.2.3 (b), was partly due to the teachers' personal activities. "That's why sometimes teachers appeared preoccupied but actually time was spent there (Facebook, online shopping and other personal activities). So, our internet at this school became slow…not used for teaching and learning, however it's for those stuff. However, to prevent it…it is also difficult!" (Senior Assistant, 27th June 2018).

Analysis from the students' interview also suggested that they found internet connectivity in the school quite slow. Abdul and Diana from Group 2 emphasised that as students who were staying in the school hostel, they sometimes had problems accessing Frog VLE in the computer laboratory especially if it rained heavily, because there were interruptions to the wifi service. Furthermore, Abdul added, "If there were too many people using the school's internet, it got slow. Sometimes even to access Frog VLE was not possible." (Abdul, 6th June 2018).

With regard to the ICT Integration model, the senior assistant believed all four categories of teachers were present in Symfony. However, in his opinion, most of the teachers were in the category of Selective Adopters. In relation to Frog

VLE, the Selective Adopters were teachers who integrated the platform for teaching and learning whenever they found educational materials suitable to help their students especially for their examinations. He emphasised,

> "…our target is achievement in exams…It's good that they (the students) gained more opportunities and confidence to speak but in the end it's the results that the parents will ask, right? So that's the problem…there's a conflict. The parents want us to conduct extra classes! They don't mind about this learner-focused at all! If we implement learner-focused like what the MOE encouraged, sometimes teachers informed it would take time to cover the syllabus. This happened despite we as administrators highlighted to the teachers that there's no need to integrate VLE or learner-focused everyday. So…that's why I think there are more teachers here (*pointing to Selective Adopters*)" (Senior Assistant, 27th June 2018).

4.2.6 Summary of Findings for Symfony

Findings from the case study in Symfony revealed that actual utilisation of Frog VLE by teachers who took part in the study was at a moderate level. Most of the teachers utilised Frog VLE in teaching and learning because they wanted to provide the students with additional resources to enhance understanding of topics. Most often, the supplementary resources were in the forms of notes, slides, links to relevant websites and exercises deemed helpful to prepare students for their assessments and examinations. Similarly, the participating teachers' involvement in learning site development in Frog VLE was between a low to moderate level. Most of the teachers developed their learning sites in Frog VLE to diversify their teaching approaches as well as to cater for the students' independent learning.

The majority of the participating teachers in Symfony held positive beliefs regarding the suitability of Frog VLE integration within the education system in the country. Apart from that, the teachers also believed that the integration of Frog VLE helped to develop useful skills to prepare the students for life at tertiary

level and future careers. However, despite the positive beliefs, the teachers' actual utilisation of Frog VLE and their involvement in learning site development remained moderate possibly due to some first-order barriers. Some examples of the first-order barriers were low skill levels, less user-friendliness of the VLE platform, time constraints and slow internet connectivity in the school. The school administrators and ICT coordinator in Symfony had launched some initiatives to tackle some of the first-order barriers. For instance, the school formed a group of Frog Champions to assist teachers and students in solving skill-related issues. Furthermore, CPD sessions were conducted in smaller groups based on teachers' Frog VLE competence levels.

Findings from the study in Symfony also suggested some second-order barriers. As highlighted by the senior assistant, results from a survey conducted by the VLE team in Symfony revealed that one of the reasons for slow internet connectivity was because the teachers used the school's wifi connection for personal web-surfing during school hours. The MoE has been providing access to internet connectivity (via wifi or other connecting devices) to all national schools in Malaysia as a measure to enhance students' learning experience (Ministry of Education Malaysia, 2013). Hence, the teachers' personal web-surfing using the school's wifi was regarded as an ethical issue, especially when in this current study, some students complained that the internet in Symfony became slower during school hours.

Apart from the teachers' perceived unethical behaviour, another second-order barrier identified in Symfony was the existence of a conflict between the MoE's aspirations and the wishes from the students' parents. In particular, the MoE

encouraged the implementation of 21st century teaching and learning approaches supported by the VLE integration. However, the students' parents hoped to have their children excel in examinations. As a result, the majority of teachers utilised Frog VLE mainly to adhere to instructions from the MoE. At the same time, integration of Frog VLE was mostly to provide supplementary resources for the students' preparation for assessments and examinations. Hence, findings from Symfony suggested that many of the teachers were in the category of Selective Adopters based on the Teachers' ICT Integration model.

Nonetheless, although the emphasis on student-focused approaches were less embraced by the majority in Symfony, the utilisation of Frog VLE to support 21st century teaching and learning activities still occurred especially among teachers who had experienced or witnessed salient outcomes associated with the benefits of the VLE platform. The salient outcomes comprised of the benefits of Frog VLE integration for both the teachers and the students. For instance, teachers and students highlighted the benefits of cloud storage facility in Frog VLE and the ease of conducting student group work and presentations. In addition, there was evidence of more detailed learning opportunities and collaborations among students as well as between the teacher and students with the utilisation of Frog VLE that emphasised 21st century teaching and learning activities.

4.3 Pascal

Pascal was a fully residential school located in a sub-urban area in the north-eastern part of Selangor. Just like many other fully residential schools in the country, students in Pascal came from different states in Malaysia. The criteria for student admission were predominantly based on excellent academic and co-

curricular backgrounds during their primary school level. The majority of students typically had scored between 4As to 5As in their Year 6 (age 12 years old) examination at primary school level. In 2011, Pascal was recognised as a High Performance School (HPS) and in 2014, it was also listed as one of the 10 fully residential schools in the country to achieve recognition as a School of Global Excellence (SGE). Both recognitions were awarded by the MOE based on the school's outstanding merit and achievements at national as well as international levels. Pascal was a co-educational school emphasising Islamic Religious studies in its curriculum. At the time of data collection, there were 541 students and 57 academic staff including 9 staff who held managerial positions such as the school Principal, Senior Assistants and Senior Subject Teachers (abbreviated as GKMP).

4.3.1 Participants' Demographic Information

There were 25 respondents who took part in the teacher survey. Only one teacher responded online while the remaining 24 respondents answered the questionnaire using the hardcopy version. The majority of respondents were female (20 teachers, 80.0%) and 5 (20.0%) respondents were male teachers as represented in Figure 16. Statistics from the Selangor State Education Department indicated that at the time of data collection, there were 3,520 (76.0%) female teachers and 1,098 (24.0%) male teachers in post-primary schools around Gombak district which was within Pascal's locality (Jabatan Pendidikan Negeri Selangor, n.d.).

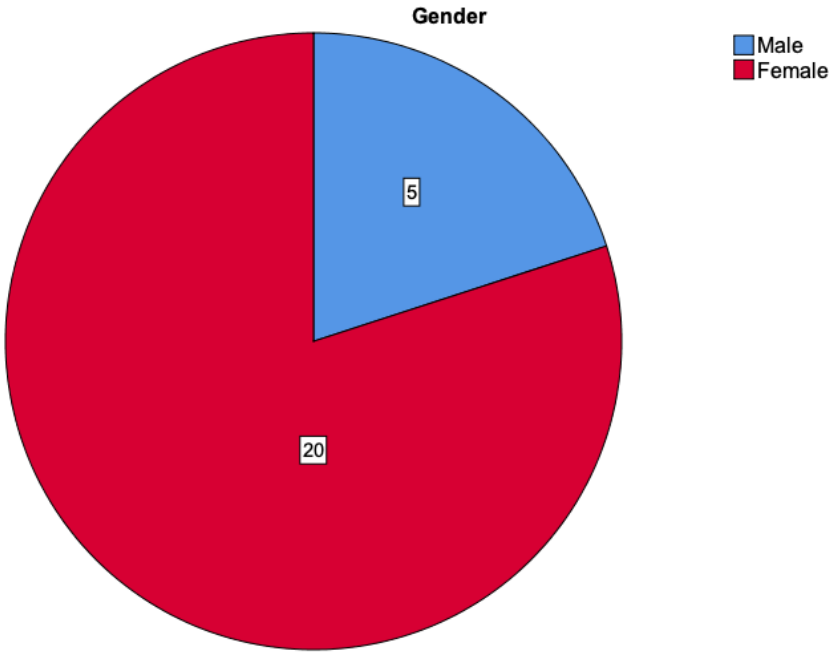


Figure 16: Respondents' Gender Distribution (Pascal).

The youngest respondent in the teacher survey was 27 years old and the oldest was 59 years old as indicated below.

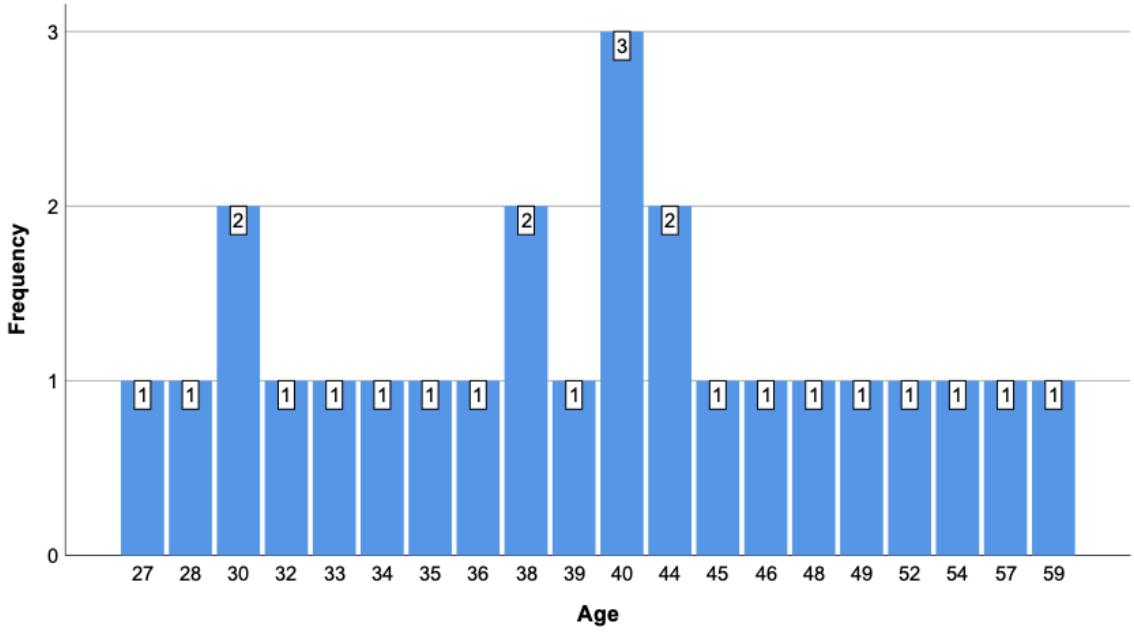


Figure 17: Respondents' Age Distribution (Pascal).

A summary of the subjects taught by the respondents is as portrayed below.

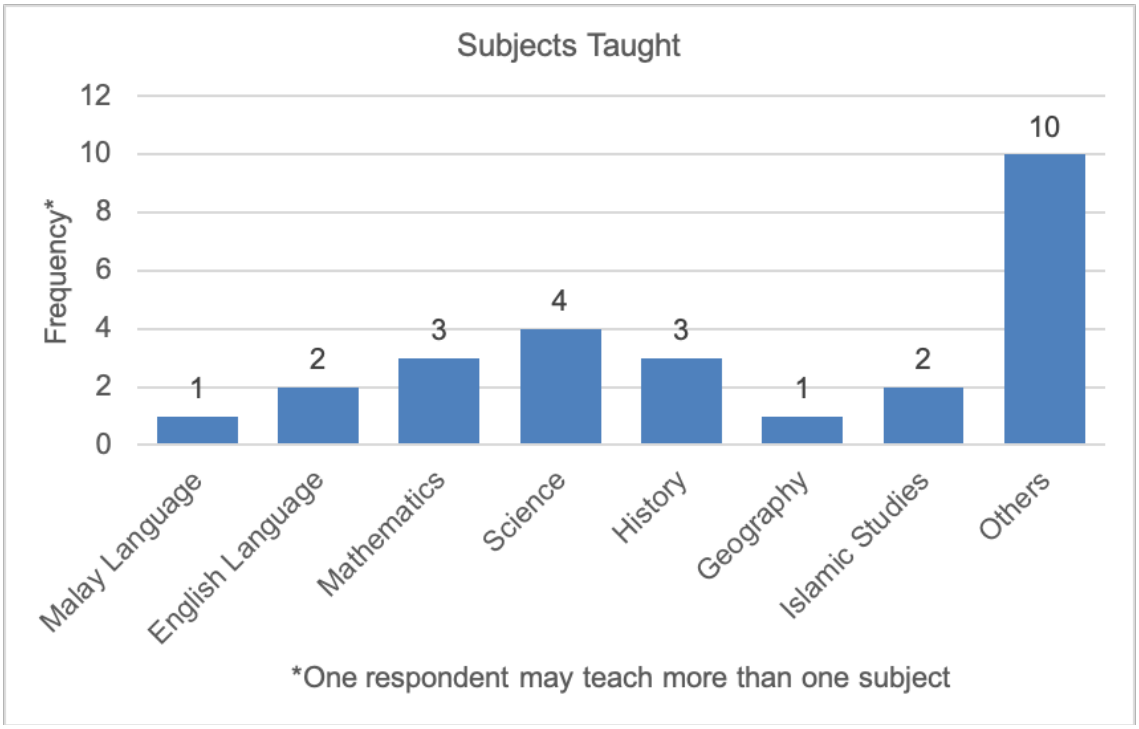


Figure 18: Subjects Taught by Respondents (Pascal).

In relation to experience with Frog VLE, the variations of answers recorded by the respondents ranged from 1 year to 4 years as displayed in Table 19.

Table 19: Year (s) of Experience Utilising Frog VLE (Pascal).

Number of Years	Frequency	Percent
1	7	28.0
2	6	24.0
3	7	28.0
4	5	20.0
Total	25	100.0

In the meantime, the participants who took part in the teacher interview sessions comprised of two female teachers and one male teacher. One teacher was in the forties age group and the other two participants were in their thirties. Table 20 displays a summary of the three teachers' demographic information and pseudonyms used for this study.

Table 20: Teacher Pseudonyms and Demographic Information (Pascal).

Teacher & Pseudonym	Gender	Age group	Years of teaching experience	Subjects taught in Pascal
Teacher 1: Lily	Female	30s	12	Mathematics, Additional Mathematics.
Teacher 2: Fazilah	Female	30s	5	Arabic language.
Teacher 3: Nazim	Male	40s	12	Islamic Studies, Islamic and Sharia Studies.

With the exception of Fazilah who was only teaching Arabic language for students in the Lower Secondary (Forms 1 to 3), the other two teachers were teaching classes both in the Lower and Upper Secondary (Forms 4 and 5). Lily taught Mathematics to the Form 3 (15 years old) students and Additional Mathematics to the Form 4 (16 years old) students. Meanwhile, Nazim taught Islamic Studies to the Form 2 (14 years old) and Form 3 students. In addition, Nazim's classes for the Islamic and Sharia Studies subject were for the Form 4 students.

A total of 12 students in Pascal were interviewed regarding their experience with Frog VLE. Table 21 displays a summary of the demographic information and pseudonyms of the students.

Table 21: Demographic Information and Pseudonyms of Pascal Students Involved in the Interview Sessions.

Student Group Number	Age & Class / Level	Gender	Count	Pseudonyms
One	13 years old, Form 1	Boys	0	-
		Girls	4	Juni, Yanti, Izza, Aliya
Two	13 years old, Form 1	Boys	1	Daniel
		Girls	3	Huda, Sherry,Dayang
Three	14 years old, Form 2	Boys	0	-
		Girls	4	Alice, Najwa, Sylvia, Nabila
Total number of students			12 students (1 boy, 11 girls)	

4.3.2 Teachers' Actual Utilisation of Frog VLE for Teaching and Learning

(a) Frequency of Integration

The results from the teacher survey revealed that in Pascal, the majority of respondents (14 teachers, 56.0%) integrated Frog VLE once a month for the purpose of teaching and learning with their students. Eight (8) respondents (32.0%) indicated that the utilisation of Frog VLE occurred between 2 to 5 times per month. Only 3 respondents (12.0%) reported that they had never integrated Frog VLE in the lessons they conducted with their students. The detailed results are presented in Figure 19.

The majority of respondents in Pascal were those teaching core subjects such as Science, Mathematics, Islamic Studies and History (see Figure 18). Allocation of teaching and learning sessions for these core subjects were between 3 to 4 hours per week for each class of students. The statement in the questionnaire required the teachers to make reference to any one particular class that they were teaching in Pascal when indicating the frequency of Frog VLE integration. Hence, based on the TALIS average of 17 teaching hours per week for Malaysian teachers, it was possible that a respondent who utilised Frog VLE once a month for teaching and learning was actually integrating the VLE platform between 4 to 6 times per month with all the taught classes. Therefore, the actual utilisation of Frog VLE for teaching and learning as reported by the respondents in Pascal was at a moderate level.

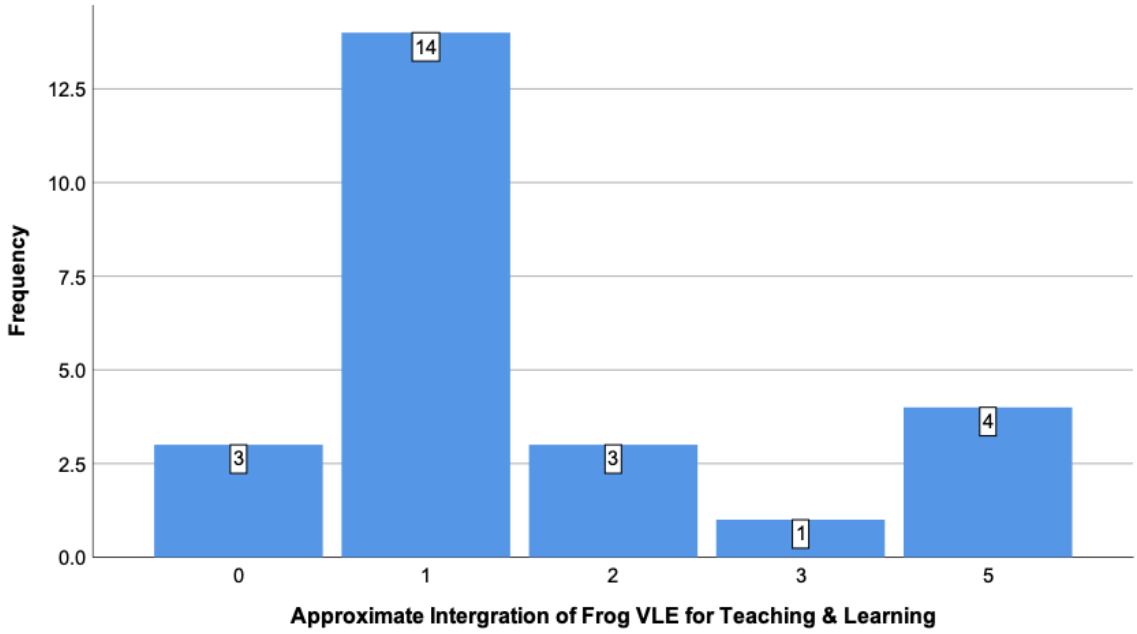


Figure 19: Approximate Integration of Frog VLE for Teaching and Learning in Pascal (per month).

The result from Spearman's Rank Order (rho) correlation test between age and actual Frog VLE utilisation yielded a r_s = -.130 and p > 0.01. The correlation coefficient (r_s) value indicated a negative relation, to suggest that the younger the respondents' age, the higher the utilisation of Frog VLE. However, the amount of -.130 suggested only a very weak correlation, depending on the result of the Sig. (p-value). Since the p-value was higher than 0.01, there was generally no evidence to correlate between age and actual Frog VLE utilisation among the respondents in Pascal. In other words, age did not contribute much to the extent of actual Frog VLE utilisation among the respondents in Pascal.

(b) Utilisation of Specific Features in Frog VLE

In relation to the features in Frog VLE, the results in Table 22 suggested that the respondents in Pascal mostly used the platform to assign homework to their

students. The 'assign homework' attribute scored the highest mean (0.96) among the list of Frog VLE features included in the survey. Nonetheless, only 12 respondents actually utilised the 'assign homework' feature in which the majority of them (8 teachers, 32.0%) used it once a month. The other 13 respondents (52.0%) revealed that they never utilised the 'assign homework' feature at all.

The survey results also suggested that the features enabling communication to occur via Frog VLE were least utilised by the respondents. For instance, 22 respondents (88.0%) admitted that they never used Frog VLE to communicate with the students' parents. In relation to teacher-student communication, 13 respondents (52.0%) responded that they never gave feedback about homework to students via the VLE platform.

Table 22: The results for actual utilisation of specific features available in Frog VLE (Pascal).

No.	Survey Item	Never		Once a month		Once a week		More than once a week		Mean
		f	%	f	%	f	%	f	%	
1	**Teacher assigns homework to students**	13	52.0	8	32.0	2	8.0	2	8.0	**0.96**
2	Teacher utilises Frog VLE to give feedback to students about homework	13	52.0	7	28.0	3	12.0	2	8.0	0.92
3	Teacher communicates with students' parents via Frog VLE	22	88.0	2	8.0	0	0	1	4.0	0.28

Legend: f (frequency), % (percentage).

(c) Application of Frog VLE for Teaching and Learning in Pascal

In terms of the main reason for integrating Frog VLE in teaching and learning, the results from a cross-tabulation analysis between age groups, gender and main purpose for Frog VLE utilisation showed almost equal responses between three of the options available (see items (i), (ii) and (iii) in Table 23). Five respondents (20.0%) expressed that the integration of Frog VLE occurred mainly because they wanted to share supplementary resources with their students as well as to test the students' understanding regarding topics that they have taught in class. Meanwhile, 6 respondents (24.0%) indicated that they integrated Frog VLE in teaching and learning to provide additional resources for students. Similarly, another 6 respondents (24.0%) highlighted that they utilised Frog VLE in teaching and learning to give opportunities for students to further explore and express opinions regarding the topics learnt.

During the teacher interview, Lily who taught Mathematics and Additional Mathematics explained that she utilised Frog VLE typically to share with her students the notes she used during teaching and learning sessions in the classroom or relevant notes she gathered from other teachers' learning sites from different schools in Malaysia. In contrast, Fazilah and Nazim preferred to utilise Frog VLE as a means to encourage more active participations from their students. Fazilah and Nazim explained that they often assigned their students to collaborate in groups and present findings based on subtopics or themes. The students utilised Frog VLE to search for information, prepare slides or videos, save the project assignments and share their presentation materials with the teachers and classmates.

In relation to age, as indicated from the Spearman's Rank Order (rho) correlation test result described earlier in 4.3.2 (a), there was no evidence to correlate between age and actual Frog VLE utilisation among the respondents in Pascal. The result in Table 23 also suggested a similar finding to the Spearman's test. It was also difficult to associate a clear pattern of answers with regard to the main purpose of Frog VLE integration selected by respondents from the different age groups. However, there were more respondents (6 teachers, 60.0%) from the 30s age group who had selected options related to the traditional, teacher-focused and content-oriented approach (labeled (i) and (ii) in Table 23). Only 3 respondents (30.0%) had chosen options associated with the 21st century teaching and learning concepts (labeled (iii) and (iv) in Table 23).

In other words, findings from the survey as portrayed in Table 23 suggest that respondents from the 30s age group in Pascal were more inclined to integrate Frog VLE in the traditional, teacher-focused and content-oriented approach as emphasised by Lameras, Levy, Paraskakis and Webber (2012) when describing the four categories of VLE use. Lily was an example of a teacher in her 30s who was inclined to integrate Frog VLE according to a more traditional approach. Her responses as cited earlier in this section regarding her typical Frog VLE integration method (such as only to share notes related to topics), portrayed the teacher-focused and content-oriented nature of Frog VLE integration for teaching and learning.

4.3.3 Teachers' Frog VLE Utilisation Factors

(a) Suitability for The Education System

Findings from the teacher survey in Pascal revealed that 17 respondents (68.0%) believed Frog VLE was capable of supporting the implementation of the education system such as the curriculum and syllabus. Analysis from the teachers' interview sessions indicated that two of the teachers (Fazilah and Nazim) were comfortable with Frog VLE integration for the subjects that they were teaching in Pascal. Nazim who taught Islamic Studies for the Lower Secondary students explained that apart from facilitating his students to do group work and presentations using Frog VLE, he also encouraged his students to utilise the platform for examination purposes. According to Nazim (18th July 2018),

> "We prioritise from the first month (January) until the fifth month (May) for students to do group work, search for information and do presentations…Now (July) I concentrate more on students sitting for the main examination. Students can get a lot of information, especially nowadays many questions relate to HOTS (higher-order thinking skills). So, it is very important they look for information and explore (Frog VLE)."

Table 23: Cross-tabulation analysis between gender, age groups and their main purpose for integration of Frog VLE (Pascal).

Age groups	Gender	Not applicable	(i) To provide additional resources	(ii) To provide additional resources and test students' understanding	(iii) To allow students to further explore topics and express opinions (discussions & debates)	(iv) To allow students for further exploration of topics, collaborate in groups and present new discoveries	Total
20s	Male	0	0	0	0	0	0
	Female	0	1	0	1	0	2
30s	Male	0	0	**2**	0	0	**2**
	Female	1	**3**	**1**	**1**	**2**	**8**
40s	Male	1	0	1	1	0	3
	Female	1	1	1	2	1	6
50s	Male	0	0	0	0	0	0
	Female	2	1	0	1	0	4
Total		5	**6**	**5**	**6**	3	25

Nazim's opinion regarding the breadth of suitable information available on Frog VLE was also reflected in the survey data whereby 13 respondents (52.0%) indicated that they utilised Frog VLE due to the availability of quality academic resources. However, Lily shared a different opinion regarding the suitability of integrating Frog VLE to support the curriculum, syllabus and examination. According to Lily (4th June 2018), "Fun things will be for Form 1 or Form 2 (not involved in major public examinations). The exam classes…we are a fully residential school, we want to complete the syllabus quickly. Expectations are higher." Lily who taught Mathematics as well as Additional Mathematics felt that the integration of Frog VLE in teaching and learning was less suitable for those subjects. She preferred the traditional method of teaching and learning but still utilised Frog VLE to supplement her classroom pedagogy.

(b) Teacher-related Factors

Analysis from the quantitative and qualitative data suggested that teachers' beliefs was one of the factors contributing to the utilisation of Frog VLE among teachers in Pascal. As described in Chapter 2, teachers' beliefs are often related with the teachers' philosophy about teaching and their conception of knowledge (Sang, Valcke, van Braak, Tondeur, & Zhu, 2011). As a school with HPS and SGE recognitions, many of the teachers in Pascal appeared to place high importance on the students' examinations and academic results. Nazim as quoted in 4.3.3 (a) admitted that he encouraged his students who were preparing to sit for major public examinations to utilise Frog VLE in order to explore information and exercises especially related to HOTS questions. Similarly, Fazilah explained that from January to April, she usually allowed her students to

be more creative in exploring Frog VLE, searching for information and materials for group presentations. However, from the month of May onwards she switched to focusing more on the syllabus content for classes that were involved in public examinations.

In addition to the qualitative analysis, the survey result in Pascal also revealed that 16 respondents (67.0%) integrated Frog VLE in teaching and learning whenever they found useful resources to help their students improve their academic grades. This survey result not only enhances the importance of maintaining academic achievements in Pascal but also suggests that the majority of participants in this school were Selective Adopters based on the ICT Integration model. The Selective Adopters (SA) are teachers who often find themselves confined to a more rigid assessment system, despite having a good understanding regarding their technological, pedagogical and content knowledge (Donnelly et al., 2011). Consequently, the SA such as the majority of respondents in Pascal continued to integrate Frog VLE but usually when they believed the resources available via the VLE platform would help students "to do better in their final assessment" (Donnelly et al., 2011:1478).

During the interviews, all three teachers admitted that at the beginning stage, they started utilising Frog VLE to adhere to the instruction from the school administrators. Nonetheless, Fazilah and Nazim expressed that after exploring Frog VLE, they became more interested to utilise the platform because it helped ease their duties as teachers. Nazim described, "Everything is already in there (Frog VLE). All the students' work is also kept in there as reference. The work will not disappear. We can refer or retrieve anytime we need to do so" (Nazim, 18th

July 2018). However, Nazim added that his other reason for utilising Frog VLE on a daily basis was because he felt responsible as a teacher in Pascal to help the school raise its VLE utilisation ranking among schools in Malaysia. As for Lily, she disclosed that adherence to instructions remained as her main reason for Frog VLE utilisation. In her opinion, Lily explained that it was difficult for her to integrate Frog VLE to teach Mathematics. Furthermore, she highlighted the availability of other mediums such as a Whatsapp group that her students preferred to use in order to receive lesson notes from her.

(c) Student-related Factors

The Interconnected Model of Teacher Professional Growth suggests that one of the factors influencing teacher change is because the teachers have experienced or observed salient outcomes from an implementation or experimentation (Clarke & Hollingsworth, 2002). Based on the survey, 16 respondents (64.0%) recorded that they became more motivated to utilise Frog VLE after observing outcomes that were deemed favourable in their opinion. For instance, 16 respondents (64.0%) indicated that since utilising Frog VLE for teaching and learning, they noticed that their students were able to do more independent learning. On a similar note, Nazim detailed that among his motivations to keep utilising Frog VLE for teaching and learning was due to his own reflection after having some experience with the platform as well as based on the response shown by his students. During the interview, he highlighted the following:

> "At first I thought it (Frog VLE) was difficult, but once you are used to it, it feels rather…fun! What makes me more excited is that I always see my students liking it too!" (Nazim, 18th July 2018).

Analysis from the students' interview sessions suggested that most of the students were in favour of having Frog VLE as part of their learning experience. Aliya, Yanti, Huda, Fatima and Najwa highlighted that Frog VLE provided them with an alternative way of doing study revision. These students particularly enjoyed playing games in Frog Play as well as answering questions in Quizizz (Frog VLE's version of a quiz). The game scenario and questions in Frog Play and Quizziz were always related to the context of their lessons but presented in a less conventional way. Furthermore, the other students, (Yanti, Sherry, Alice and Fatima) added that instead of only limited to reading hardcopy books and paper notes for their revision, Frog VLE enabled them to access a wider range of study materials such as softcopies of notes, their teachers' presentation slides and other relevant resources. Simultaneously, the students did not have to worry about carrying many books or heavy bags. As specified by Alice,

> "If we have learnt something and then there is a long school holiday. Sometimes we forget what we have learnt, but with Frog VLE, it is still easy to access our lessons at home even during the school holidays…previously during school holidays if we're not at home we had to bring books or papers. It's difficult. Nowadays if we don't have our own mobile phones, we can still borrow from our father or mother, we can still access Frog VLE and read the notes. More convenient!" (Alice, 10th July 2018).

Referring to Table 24, most of the students expressed that in their opinion, Frog VLE integration in teaching and learning helped to encourage more interactions between the teachers and students (see item 1). According to Izza, a student from Group 1, "With the VLE, we can ask questions to teachers, not necessarily face-to-face. Since I began to ask questions and the teachers answered…sometimes there (in the VLE) or usually in class, I gained confidence to ask teachers more questions" (Izza, 10th July 2018). Another student from Group 1, Juni, shared the following self-reflection:

> "I feel that I have changed a lot. I am rather shy to ask the teacher especially during class because sometimes when I do want to ask a question, my friends make fun of me…So, since we have started using Frog VLE, I just ask my teachers through Frog VLE because it is more private…only the teacher and I know that I asked the question. It's easier!" (Juni, 10th July 2018).

Meanwhile, Najwa and Fatima believed that since utilising Frog VLE to do their revision, they also began to ask more questions to their teachers, either via face-to-face or using another social media channel. Najwa explained, "if I don't understand something that I read in the VLE, I will meet with the teacher on another day in the teacher's room and ask some questions. The teacher will straightaway explain. I do interact with teachers through Frog VLE as well" (Najwa, 10th July 2018). Similarly, according to Fatima, "I am the type that is shy to speak in class. When I do revision at home and there is something I don't understand, I will ask the teacher through Whatsapp. The teacher usually explains there" (Fatima, 10th July 2018).

Table 24: Pascal Students' Reasons for Enjoying the Utilisation of Frog VLE.

Item	Reasons	Students
1	**Easier to ask questions, encourage teacher-student interactions**	Juni, Yanti, Izza, Aliya, Aini, Najwa, Fatima
2	Not boring, provided fun alternative in doing revision (i.e. via FrogPlay, Quizizz)	Aliya, Yanti, Huda, Fatima, Najwa
3	Reference to notes, teachers' presentations and other study materials	Yanti, Sherry, Alice, Fatima
4	Reduced usage of papers, books	Juni, Kathy
5	Easier to do and share materials for group work and students' presentations	Kathy, Yanti
6	Improved ICT skills	Kathy
7	Safe internet surfing (educational context)	Kathy
8	Easy reference to textbooks (audio and visual references)	Izza, Alice

The researcher had the opportunity to observe Fazilah's class session with her Form 2 students. However, since the students had just completed their mid-year examination, Fazilah took the opportunity to discuss answers to the exam questions. Frog VLE was utilised to assist the class discussion whereby from time to time Fazilah and her students referred to notes available on the teacher's learning site as well as previous exercise questions available on the VLE platform. During the observation, the students were actively involved in the whole class discussion and regularly asking relevant questions to Fazilah for clarifications.

During the teacher's interview, Fazilah explained that since she started integrating Frog VLE regularly in her lessons, she did notice her students became more motivated and there was increased participation during class discussions. She added, "I noticed my students didn't like to use many papers. They prefer something different and like to show their creativity especially with technology" (Fazilah, 4th June 2018). The other teacher, Nazim, had raised the same points regarding improvements in students' communication and creativity when he shared the following:

> "Previously when we were teaching, most students were shy to ask in class. Now, I get students asking questions through Frog VLE. When they have to do presentations, I can see they are more creative than before. They are actually better than us (teachers). Sometimes, I too learn from them how to do something using the VLE or technology. Actually, rather often (learn from students)" (Nazim, 18th July 2018).

The students were also asked to give their opinion about the suitability of Frog VLE integration with the subjects they learn in school. The result indicated that the students believed Frog VLE integration was suitable for almost all subjects they studied in Pascal, except for Mathematics. Fatima from Group 3 claimed that

after utilising Frog VLE more frequently since she started studying in Pascal, her academic results had shown gradual improvements. Fatima attributed her improvements to the abundance of relevant notes and exercises in Frog VLE. Apart from that, Fatima outlined that her teachers gave a lot of assignments that required information searching and completion via Frog VLE.

Meanwhile, Juni described that for most subjects, utilising Frog VLE made learning "more convenient" but for Mathematics, she found it was difficult to understand the concept and solutions to Mathematical problems. Hence, according to Juni, "I really need face-to-face interaction with my Maths teacher" (Juni, 10th July 2018). Aini reiterated the opinion in her comment, "For Maths, maybe it is quite difficult to use Frog VLE because we have to show the way we use the Mathematical formula and detail out the solutions to the questions. We cannot show it (the solutions) in Frog VLE" (Aini, 10th July 2018).

4.3.4 Further Utilisation of Frog VLE for Teachers' Professional Practice

(a) Development of The Teachers' Learning Sites

Based on the survey in Pascal, many of the respondents (12 teachers, 48.0%) regarded themselves as having intermediate skill level in relation to development of their own learning sites in Frog VLE. Referring to Figure 20, a total of 22 respondents (88.0%) suggested that they knew how to develop learning site in Frog VLE since they assessed themselves as having between low to advanced skill levels. Only 3 respondents (12.0%) indicated that they had no skill at all.

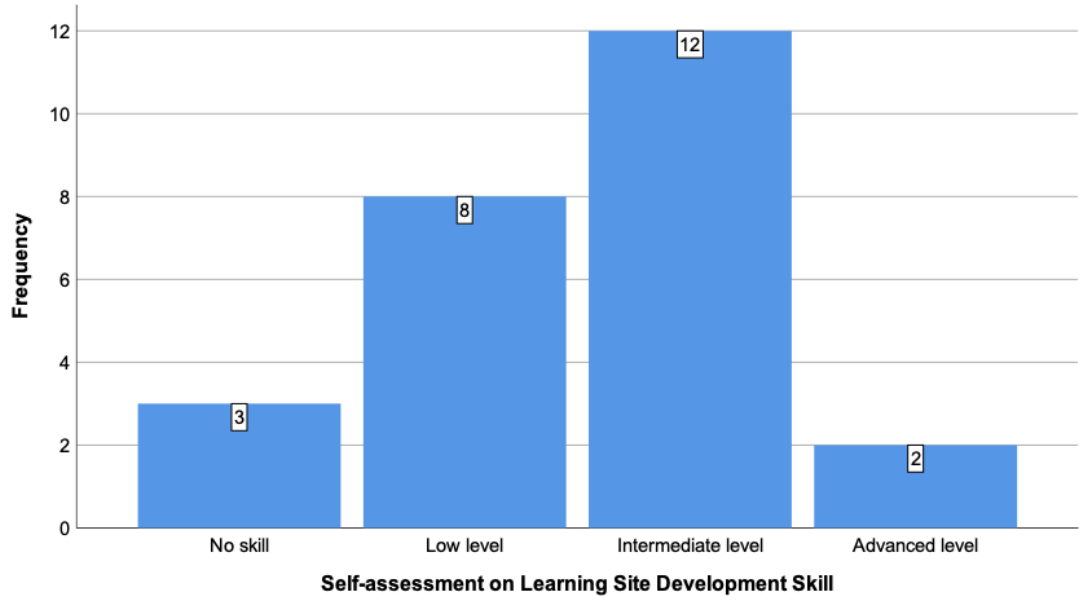


Figure 20: Pascal Teachers' Self-assessment on Learning Site Development Skill.

As portrayed in Figure 21, the majority of respondents (16 teachers, 64.0%) reported that at the time the survey was conducted they had developed between only 1 to 10 learning sites in Frog VLE. Meanwhile, there were 6 respondents (24.0%) who indicated that they had developed zero (0) learning site. Thus, the result demonstrated that in Pascal, the extent of teachers' involvement in learning site development for Frog VLE was at a moderate level.

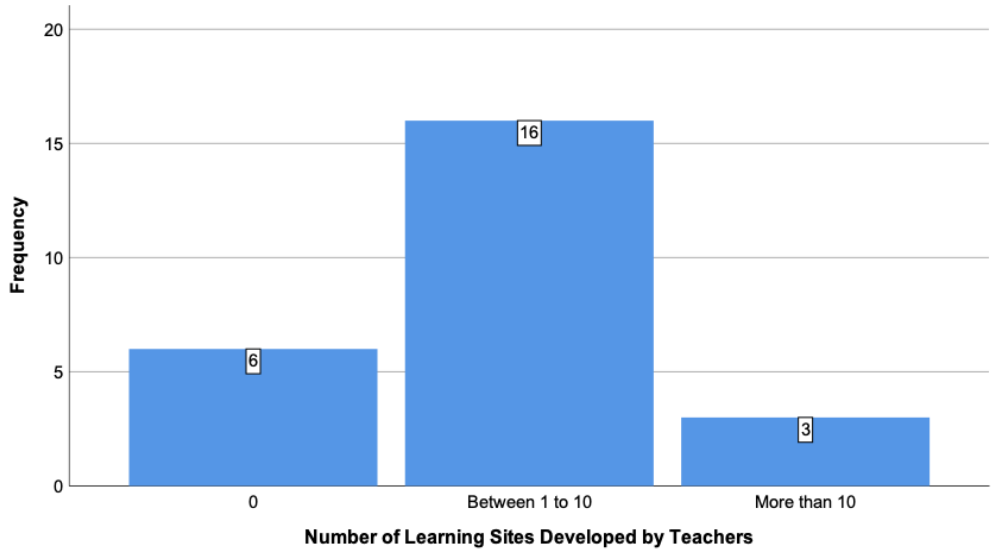


Figure 21: Learning Site Development (Pascal).

The results between Figure 20 and Figure 21 portrayed a significant difference between the number of respondents who reported that they had no skill and those who declared that they had never developed any learning site in Frog VLE. The difference in number between the total respondent who self-assessed themselves as having no skill (3 teachers) and those who indicated that they had never developed any learning site (6 teachers) suggested that apart from skill level, there were potentially other factors hindering the teachers from developing learning sites in Frog VLE.

Based on an analysis from the interview sessions with the teachers, issues with regard to user-friendliness of the platform, time constraint and teachers' workload were among the contributing factors impeding some teachers from developing or regularly updating their learning sites. Lily expressed that in her opinion, developing her own learning site is a burden because "Frog (VLE) isn't that friendly. To do a small edit, you have to press something first, then wait before you have to press something else…there are particular steps, not that simple!" (Lily, 4th June 2018). Fazilah admitted that she used to update her learning site more often but could not find time to do so lately. Nazim who utilised Frog VLE everyday emphasised, "I don't have time to update (*laughing*). To update my own site… well, I have a lot of other work. I don't have the time!" (Nazim, 18th July 2018).

With regard to the learning site development widgets available in Frog VLE, results from the teacher survey showed that the respondents in Pascal most commonly used the 'embed website' widget (20 respondents, 80.0%). Next was the utilisation of the 'media' widget (19 respondents, 76.0%). A similar result was

derived from the interview analysis whereby the teachers highlighted utilising Frog VLE to share links to relevant websites as well as Youtube videos related to the content they were teaching. The survey result showed that 13 respondents (52.0%) had some experience in utilising one of Frog VLE's communication channels called the 'forum' widget. However, the 'forum' remained as one of the less popular features in Frog VLE, alongside 'The Pond' and 'file drop' widgets. Therefore, it supported the earlier findings regarding lack of utilisation of Frog VLE for communication purpose as elaborated in 4.3.2 (b).

Based on Table 25, the main reason behind the involvement of the respondents in developing learning sites was for the students' independent learning. Indeed, analysis from the teachers' interview sessions also suggested the same reason as among the motivation for the teachers to utilise Frog VLE, namely to provide their students with supplementary notes and links to useful resources. Meanwhile, the second highest reason was for the teachers' own future teaching reference (item 2). The least popular reason chosen by the respondents in Pascal was for item number 3 (to share lesson plans with other teachers).

Table 25: Reasons for Learning Site Development (Pascal).

No.	Reasons	Frequency	Percent
1	To diversify teaching approaches	10	40.0
2	For own future teaching reference	12	48.0
3	To share lesson plans with other teachers	5	20.0
4	**For students' independent learning**	**13**	**52.0**
5	To achieve lesson objectives	9	36.0

(b) Utilisation in Other Areas

Apart from teaching and learning, teachers in Pascal also used Frog VLE for other professional collaborations. For instance, during the interview Fazilah showed the researcher a Frog VLE site she created for the Islamic Studies teaching panel. All teachers in the panel used the site to upload and share work proposals, photos and reports of activities or programmes that they conducted either amongst teachers or with the students in Pascal. The VLE Coordinator also shared similar information whereby she informed that in Pascal, all reports were submitted to the school administrators (Principal and Senior Assistants) and later made available for reference in Frog VLE. “Before this, it was difficult to get or share information especially photos. Now we put everything in Frog Drive or accessible via Frog VLE” (VLE Coordinator, 4th June 2018).

In addition, Frog VLE was also utilised to manage students’ co-curricular activities. For example, a backdrop design competition was organised in conjunction with the school’s Cooperative Day celebration. Students who took part had to use their Frog VLE accounts, save drafts and submit their final backdrop designs to the committee via the platform. The VLE Coordinator explained that utilising Frog VLE for such activity provided a more efficient documentation method compared to the traditional paper submission. It also helped to reduce paper consumption and students were able to submit anytime within the specified time frame. In addition, it also increased the frequency of logins and utilisation of Frog VLE in Pascal.

4.3.5 School Highlights and Frog VLE Implementation Challenges

Results from the quantitative and qualitative data analysis suggested that availability of good ICT infrastructure was one of the key attributes supporting the implementation of Frog VLE in Pascal. Based on the survey, 17 respondents (68.0%) indicated that there was adequate ICT equipment in good working condition to implement teaching and learning with VLE. Furthermore, 16 respondents (64.0%) emphasised that there was good internet connectivity to access the VLE platform in Pascal. In an interview with the school's VLE coordinator, she described that there were 2 ICT laboratories in Pascal. In the first laboratory, there were 21 desktop computers equipped with internet connectivity using the Local Area Network (LAN) cables. Meanwhile, the second ICT laboratory contained 30 laptop computers in which internet was available via wireless connection. In addition, students in Pascal were allowed to utilise 10 computers located in the Self-access Centre. Furthermore, the school administration in Pascal also provided 40 tablet computers accessible for loan by students during learning sessions with their teachers. The VLE Coordinator added:

> "After achieving the SGE status, the school began to procure iPads for every student…the school gave iPad on loan to students who could not afford it. In the second year of SGE, more students started buying their own iPads. So, the number of personal iPads increased." (VLE Coordinator, 4th June 2018).

In relation to internet connectivity, the overall network speed in Pascal was 100 megabits per second (Mbps). The speed of 100Mbps was exceptional considering most national schools in Malaysia only have between 4Mbps to 30Mbps (Ministry of Education Malaysia, 2013). According to the VLE Coordinator, "We have done the internet speed test. At any one time, we can have 60 iPads running, as well as other devices such as smartphones…no

problem, unless they access Youtube, because all bandwidth will be pulled there" (VLE Coordinator, 4th June 2018). During interview sessions with Fazilah, Lily and Nazim, the teachers demonstrated that they were satisfied with the ICT infrastructure in Pascal for which they were able to comfortably conduct lessons with Frog VLE integration. Fazilah added the following:

> "Nowadays I would say it's almost perfect. The internet is fast and Frog VLE makes teaching and learning easier. There is an LCD projector in every classroom…I can see some differences in my teaching approach so yes, I'm generally happy" (Fazilah, 4th June 2018).

The internet speed and ICT facilities in Pascal were also commended by some of the students during the interview. Yanti and her friends from Group 1 highlighted that the internet speed in Pascal was "super fast" (Yanti, 10th July 2018). Meanwhile, students in Group 3 informed that they had no problem accessing Frog VLE in Pascal due to the availability of some alternatives with regard to ICT resources. Najwa who did not own an iPad expressed that there was no issue about completing assignments via Frog VLE. She explained, "I am one of those who don't own an iPad. After school hours, I will go to the iSmart (kiosk) to login Frog and do my assignment" (Najwa, 10th July 2018). During the school visits, the researcher was able to witness some students accessing Frog VLE using the 5 units of iSmart kiosks located along the route from the students' hostels to the classrooms.

Despite the praises given by teachers and students regarding ICT infrastructure in Pascal, there were some challenges faced by the school administrators especially at the beginning stage of Frog VLE implementation. According to the VLE Coordinator, it was difficult to get teachers to use the platform. Some teachers took more time to learn how to utilise the platform. In addition, teachers

who did not use the platform during the early years of implementation were required to submit a formal letter to the Principal, citing reasons for not utilising Frog VLE. Hence, many teachers in Pascal felt "rather forced" to use the VLE platform (VLE Coordinator, 4th June 2018).

Nonetheless, with some improvements to Frog VLE done by the service provider as well as upgrading of ICT facilities by the MoE and the school administrators, more teachers in Pascal began to utilise the platform. Apart from increasing ICT infrastructure, the administrators in Pascal also provided other types of support to motivate teachers to utilise Frog VLE. The survey demonstrated that 17 respondents (68.0%) reported there was adequate technical assistance each time they required help or encountered issues related to Frog VLE. Furthermore, the school organised Frog VLE refresher courses and CPDs every year in an effort to encourage utilisation and increase the teachers' familiarity with the platform. The VLE Coordinator explained, as follows:

> "We show and teach them again what are available in Frog and how to use them but…Sometimes the teachers are short of time! Here (in Pascal) there are many programmes, the teachers sometimes do not have enough time to upload materials. It's easy for teachers who have iPads to take photos or videos, but it's hard to find time to upload those materials!" (VLE Coordinator, 4th June 2018).

Another challenge highlighted by the VLE coordinator was regarding the availability of alternative platforms to Frog VLE. In Pascal, the use of iPads was made compulsory as part of the SGE programme. Simultaneously, teachers and students were also required to utilise iTunes U application on the iPads. The teachers in Pascal had the options to switch between utilising the two VLE platforms for teaching and learning but they were aware that Frog VLE was the official MoE application. In addition, the school had to fulfill the KPIs related to

Frog VLE. Hence, most teachers prioritised utilisation of Frog VLE, even if they were more comfortable with using iTunes U for teaching and learning.

With regard to the ICT Integration model, the VLE coordinator believed that only three categories of teachers as described in the model (Creative Adapters, Selective Adopters and Inadvertent Users) were present in Pascal. With an improved version of the VLE platform and regular CPD sessions, the VLE coordinator emphasised the following,

> "I think only the Contented Traditionalist does not exist here in this school because all the teachers do use VLE and ICT. Some teachers, although they use it rarely, they showed interest to learn and practiced together during CPDs" (VLE coordinator, 4th June 2018).

4.3.6 Summary of Findings for Pascal

In general, the actual utilisation of Frog VLE by teachers who took part in the case study in Pascal was at a moderate level. The findings in Pascal suggested that there were two varying reasons for the integration of the VLE platform in teaching and learning. Firstly, integration of Frog VLE was to provide the students with additional resources to enhance understanding of topics. Secondly, an equal number of responses were also recorded for the purpose of integrating Frog VLE to allow students to further explore topics and express opinions via discussions and debates.

Analysis from the interviews with the teachers as well as students suggest that subjects taught or learnt in the school influence the utilisation approach of the VLE platform in Pascal. Whilst the majority of the participants (teachers as well as students) agreed that integration of Frog VLE was suitable for most subjects,

Mathematics was a subject that the participants found quite difficult to fully utilise the potential advantages of the VLE platform.

As a fully residential school with at least 2 distinguished MoE recognitions, the participants in Pascal placed high importance on maintaining the students' academic excellence. This was evident from the teachers' responses regarding how they typically facilitate utilisation of Frog VLE involving students who were preparing to sit for major public examinations. Hence, results from the analysis of data suggest that most of the teacher participants in Pascal were in the category of Selective Adopters (SA) based on the Teacher ICT Integration model.

There were other factors contributing to the utilisation of Frog VLE among the participants in Pascal. The majority of participants began utilising Frog VLE to adhere to instructions from the school administrators and subsequently the MoE. After gaining more experience in Frog VLE utilisation, some participants in Pascal progressed from the initial reason of adhering to instructions to other factors such as realising Frog VLE's advantage in helping them to ease their duties as teachers. In addition, participants in Pascal also utilised Frog VLE because they have witnessed other salient outcomes such as students' ability to do independent learning. This correlates with the purposes of Frog VLE utilisation cited by the participants (providing students with additional resources and to allow students to further explore topics). Apart from students' independent learning, findings in Pascal also provided evidences of increased teacher-student communications with frequent utilisation of Frog VLE. Data analysis indicated that some students began to ask questions more often either via the VLE platform or through other channels including face-to-face interactions with the teachers.

Findings from the case study in Pascal suggest that one of the main strengths supporting the implementation of Frog VLE in the school was due to the availability of good ICT infrastructure. Apart from the number of computer facilities and internet speed, the ownership and usage of personal iPads were also common in Pascal. Thus, teachers and students had alternative means to access Frog VLE for teaching and learning within the school compound. As for the teachers, the administrators in Pascal also provided constant support for them such as in the forms of CPDs and technical assistance. Consequently, findings from the case study in Pascal indicated that the participants were generally satisfied with the ICT infrastructure and support to enable Frog VLE utilisation among teachers and students in the school.

In Pascal, the main challenge faced by the participants and also highlighted by the VLE coordinator with regard to Frog VLE implementation was related to time and the teachers' workload. It was cited that teachers were involved in many school programmes, on top of their teaching responsibilities. Hence, teachers faced difficulties in finding the time to develop or update learning sites in Frog VLE. In addition, the requirements for teachers and students to utilise another virtual learning application besides Frog VLE also created an additional challenge for teachers in terms of time management and dilemma in terms of choice. Nevertheless, the teachers in Pascal were reported to prioritise the utilisation of Frog VLE as it was the official VLE platform endorsed by the MoE.

4.4 Fortran

Fortran was a regular post-primary national school located in an affluent residential township approximately 12 kilometres from Shah Alam, the capital city of Selangor state and 22 kilometres from central Kuala Lumpur, the capital city of Malaysia. Due to its strategic location close to these capital cities, this urban township consists of a cosmopolitan population and infrastructure within the area has been described as excellent (Ramakreshnan et al., 2018). Since student enrolments into Fortran were mostly from the surrounding residential areas, many of the students came from middle to high income families.

Fortran was a co-educational school adopting double school sessions (morning and afternoon) to cater for around 1,300 students. There were 89 teachers in Fortran excluding the school Principal and the senior assistants. Fortran gained recognition as one of the 'Cluster Schools of Excellence' from the MoE in 2012. The 'Cluster Schools of Excellence' is an acknowledgement given to national schools in Malaysia based on a merit system highlighting students' excellent achievements in academic, sports and co-curricular activities. As a regular post-primary national school in an urban area, Fortran was the only school in this case study that did not have hostel facility for the students.

4.4.1 Participants' Demographic Information

There were 42 respondents who took part in the teacher survey. A total of 24 respondents answered the questionnaire using the hardcopy version while 18 teachers responded online. The majority of respondents were female (38 teachers, 90.5%) and only 4 (9.5%) respondents were male teachers, as represented in Figure 22. Statistics from the Selangor State Education

Department indicated that at the time of data collection, there were 5,164 (80%) female teachers and 1,257 (20%) male teachers in post-primary schools around Petaling Perdana district which was within Fortran's locality (Jabatan Pendidikan Negeri Selangor, n.d.).

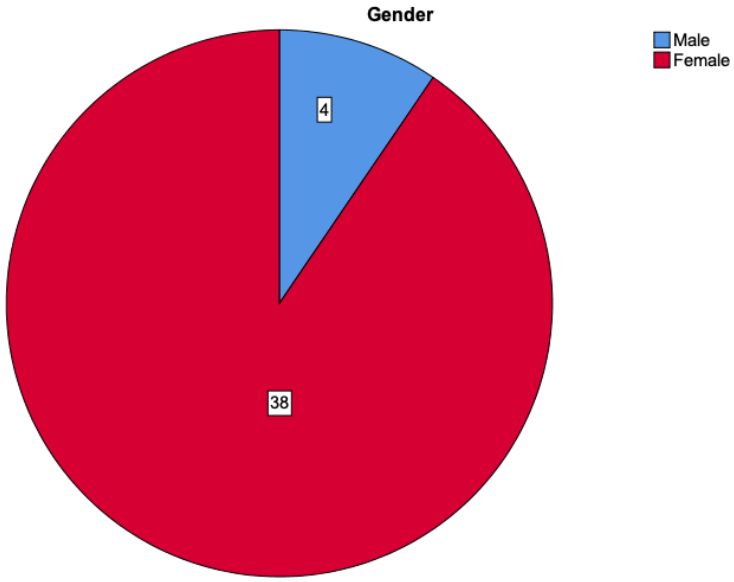


Figure 22: Respondents' Gender Distribution (Fortran).

The youngest respondent in the teacher survey was 26 years old and the oldest was 57 years old, as depicted below.

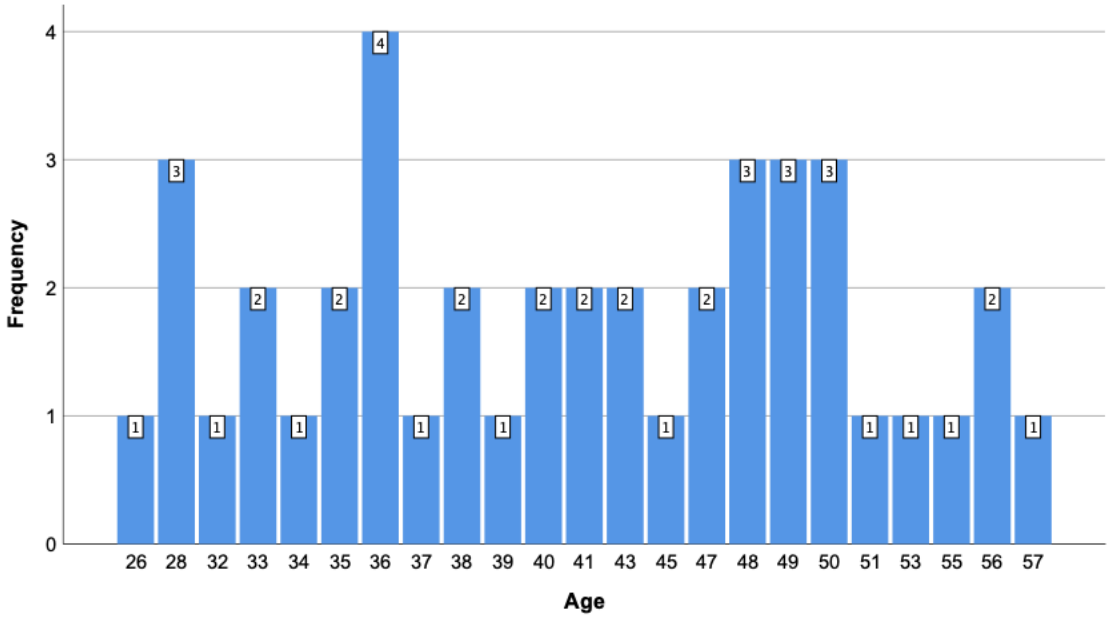


Figure 23: Respondents' Age Distribution (Fortran).

A summary of the subjects taught bt the respondents is portrayed below.

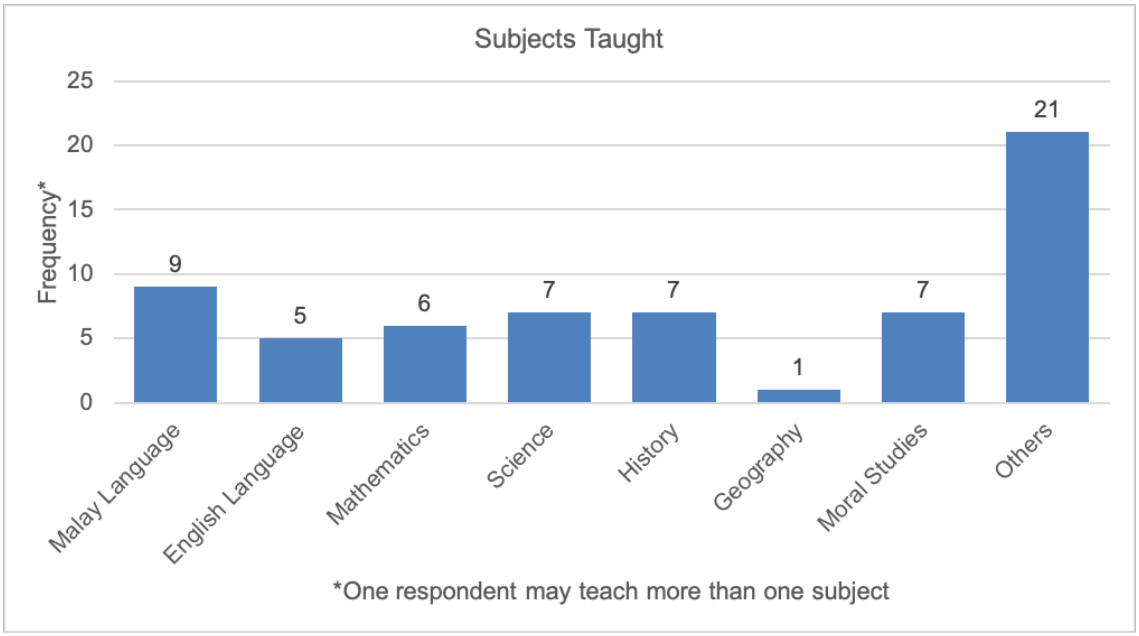


Figure 24: Subjects Taught by Respondents (Fortran).

In relation to experience with Frog VLE, the range of years varied from zero (0) or no experience at all to 6 years as displayed in Table 26.

Table 26: Year (s) of Experience Utilising Frog VLE (Fortran).

Number of Years	Frequency	Percent
0	0	0.0
1	0	0.0
2	16	38.1
3	11	26.2
4	7	16.7
5	7	16.7
6	1	2.4
Total	42	100.0

All three participants who took part in the interview sessions were female teachers representing the 30s, 40s and 50s age groups. Table 27 displays a summary of the three teachers' demographic information and pseudonyms used for this study. Kareena taught English language to the Form 1 students (age 13

years old) while Maggie and Rosalind taught Additional Mathematics and Mathematics respectively to the Upper Secondary (Forms 4 and 5) students.

Table 27: Fortran Teacher Pseudonyms and Demographic Information.

Teacher & Pseudonym	Gender	Age group	Years of teaching experience	Subjects taught in Fortran
Teacher 1: Maggie	Female	50s	26	Additional Mathematics
Teacher 2: Rosalind	Female	30s	11	Mathematics
Teacher 3: Kareena	Female	40s	15	English language

A total of 13 students in Fortran were interviewed regarding their experience with Frog VLE. Table 28 displays a summary of the demographic information and pseudonyms of the students.

Table 28: Demographic Information and Pseudonyms of Fortran Students Involved in the Interview Sessions.

Student Group Number	Age & Class / Level	Gender	Count	Pseudonyms
One	17 years old, Form 5	Boys	3	Tan, Matthew, Harry
		Girls	1	Carol
Two	17 years old, Form 5	Boys	5	Wong, Sanjay, Arjun, Kelvin, Suras
		Girls	0	-
Three	17 years old, Form 5	Boys	0	-
		Girls	4	Liu Ying, Chloe, Zara, Krisha
Total number of students			13 students (8 boys, 5 girls)	

4.4.2 Teachers' Actual Utilisation of Frog VLE for Teaching and Learning

(a) Frequency of Integration

Based on the survey conducted in Fortran, most of the respondents (23 teachers, 54.8%) reported that integration of Frog VLE for teaching and learning with

students occurred once a month. Another 10 respondents (23.9%) indicated that the utilisation of Frog VLE occurred between 2 to 5 times per month. However, there were still 9 respondents (21.4%) in Fortran who had never integrated Frog VLE in the lessons they conducted with their students. The detailed results are presented in Figure 25.

As portrayed in Figure 24, most of the respondents (34 teachers, 81.0%) were those teaching core subjects such as Malay language, English language, Mathematics, Science and History. Allocation of teaching and learning sessions for these core subjects were between 3 to 4 hours per week for each class of students. The statement in the questionnaire required the teachers to make reference to any one particular class that they were teaching in Fortran when indicating the frequency of Frog VLE integration. Hence, based on the TALIS average of 17 teaching hours per week for Malaysian teachers, it was possible that a respondent who utilised Frog VLE once a month for teaching and learning was actually integrating the VLE platform between 4 to 6 times per month with all the taught classes. Therefore, the actual utilisation of Frog VLE for teaching and learning as reported by the respondents in Fortran was at a moderate level.

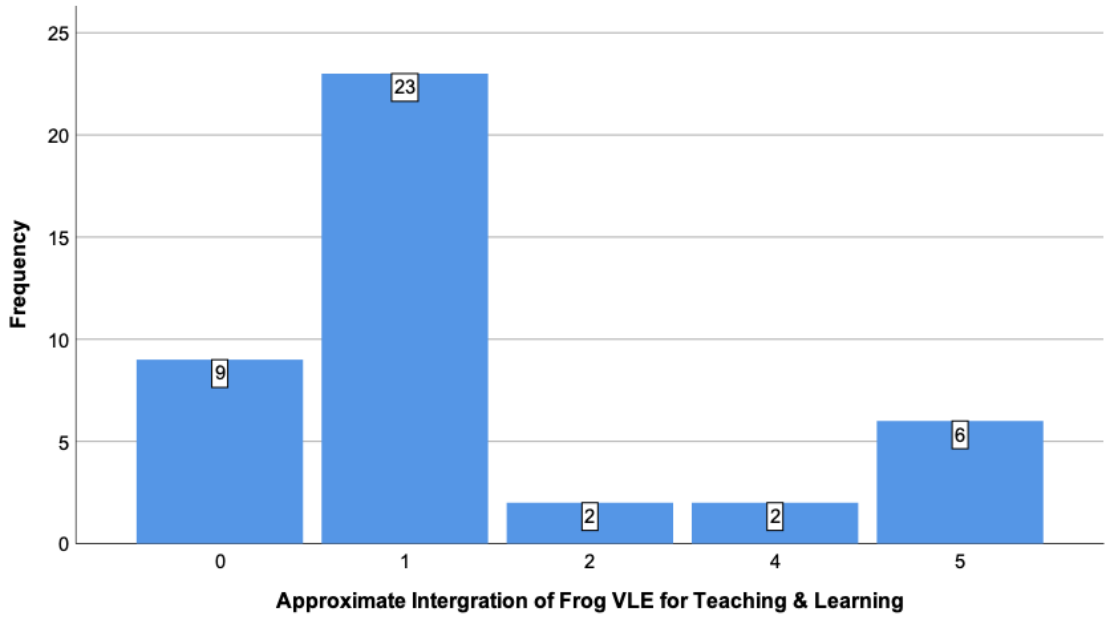


Figure 25: Approximate Integration of Frog VLE for Teaching and Learning in Fortran (per month).

The result from Spearman's Rank Order (rho) correlation test between age and actual Frog VLE utilisation yielded an r_s = -.025 and p > 0.01. The correlation coefficient (r_s) value indicated a negative relation, to suggest that the younger the respondents' age, the higher the utilisation of Frog VLE. However, the amount of -.025 suggested a very weak correlation. Since the Sig. (p-value) was higher than 0.01, there was generally no evidence to correlate between age and actual Frog VLE utilisation among the respondents in Fortran. In other words, age did not contribute much to the extent of actual Frog VLE utilisation among the respondents in Fortran.

(b) Utilisation of Specific Features in Frog VLE

In relation to the features in Frog VLE, the results in Table 29 indicated that the respondents in Fortran mostly used the VLE platform to assign homework to their students. The 'assign homework' attribute scored the highest mean (1.05) among the list of Frog VLE features included during the survey. A total of 28 respondents

(66.7%) reported that they used the VLE platform to assign homework to their students either once a week or at least once a month (see Table 29). However, there were still 14 respondents (33.3%) who indicated that they never used this Frog VLE feature at all.

Table 29: The Results for Actual Utilisation of Specific Features Available in Frog VLE (Fortran).

No.	Survey Item	Never		Once a month		Once a week		More than once a week		Mean
		f	%	f	%	f	%	f	%	
1	**Teacher assigns homework to students**	14	33.3	16	38.1	12	28.6	0	0.0	**1.05**
2	Teacher utilises Frog VLE to give feedback to students about homework	18	42.9	15	35.7	8	19.0	1	2.4	0.98
3	Teacher communicates with students' parents via Frog VLE	37	88.1	3	7.1	2	4.8	0	0	0.19

Legend: f (frequency), % (percentage).

Apart from utilising Frog VLE to assign homework to students, 24 respondents (57.1%) demonstrated that they used the platform to give feedback regarding their students' homework. Nonetheless, based on Table 29, there were still 18 respondents (42.9%) who never used the VLE feature with their students. During the teacher interview, Maggie admitted that she frequently utilised Frog VLE with her students including to assign homework for them. However, she focused on face-to-face classroom sessions to discuss answers or feedback for the homework to save some time. According to Maggie "I do discussions in the class. I'm teaching Add Maths and nowadays there are a lot of Higher Order Thinking Skills (HOTS) questions. My students' basic calculations are not that good…so I

will ask them to upload their calculations to show that they have attempted the questions. Then I discuss the answers in class to show them how to do the correct calculations" (Maggie, 23rd April 2018). Likewise, another feature available within Frog VLE that enabled communication between the teachers and the students' parents were seldom utilised by the respondents. Based on Table 29, 37 respondents (88.1%) admitted that they never used the Frog VLE feature when communicating with the students' parents.

(c) Application of Frog VLE for Teaching and Learning in Fortran

The results from a cross-tabulation analysis between gender, age groups and main purpose for Frog VLE utilisation revealed that in general, the respondents in Fortran integrated Frog VLE in teaching and learning mainly to provide their students with supplementary resources in order to enhance understanding of topics (see item (i) in Table 30). Maggie and Rosalind were examples of teachers in Fortran who mostly utilised Frog VLE to provide supplementary teaching and learning materials for their students to refer either before or after class sessions. Rosalind described the following,

> "…if I cannot use the computer lab to integrate Frog VLE during teaching and learning, I will upload my teaching materials on my (learning) site. I will tell my students to access my site when they go home" (Rosalind, 25th April 2018).

Maggie highlighted that she had developed her learning sites in Frog VLE since 2015. She elaborated that when introducing a new topic for her Additional Mathematics subject, she typically asked her students to access her learning site prior to the lesson. According to her, "It's like the flipped classroom approach. I tell my students to watch a video or read an article when they're at home. Then in class, we discuss the lessons (that) can be learnt from the video or article, for instance the application of the theory in real life, its usage. My students show

more interest in the topic if they understand how to apply in real life, rather than just knowing the theory" (Maggie, 23rd April 2018).

In contrast, Kareena admitted that she incorporated Frog VLE for teaching and learning only during school holidays to give homework to her students. Unlike Maggie and Rosalind who included notes and other supplementary resources to assist students' understanding of topics, Kareena focused on uploading exercise and examination-based questions for her students. She explained, "I don't have to spend money on photocopying. That's my main purpose actually. Once I uploaded the questions, students print them out, answer the questions and stick the printouts on their books. When they come back to school we discuss the answers" (Kareena, 23rd April 2018).

As indicated from the Spearman's Rank Order (rho) correlation test result described earlier in 4.4.2 (a), age did not correlate with the actual Frog VLE utilisation among the respondents in Fortran. The result in Table 44 also suggested a similar finding with the Spearman's test. It was difficult to associate a clear pattern of answers with regard to the main purpose of Frog VLE integration selected by respondents based on the age groups. Only the 30s age group had zero respondents selecting options related with the 21st century teaching and learning concepts (labeled (iii) and (iv) in Table 30). Hence, it suggested that despite having the most number of respondents based on age groups, the respondents in their 30s were more inclined to integrate Frog VLE in the traditional, teacher-focused and content-oriented approach (outlined in Table 30 via labels i, ii, iii and iv). Responses from the other age groups represented all categories of the VLE use.

Table 30: Cross-tabulation analysis between gender, age groups and their main purpose for integration of Frog VLE (Fortran).

Age groups	Gender	Not applicable	(i) To provide additional resources	(ii) To provide additional resources and test students' understanding	(iii) To allow students to further explore topics and express opinions (discussions & debates)	(iv) To allow students for further exploration of topics, collaborate in groups and present new discoveries	Total
20s	Male	0	0	0	0	0	0
	Female	2	1	0	1	0	4
30s	Male	0	0	0	0	0	0
	Female	4	8	1	0	0	13
40s	Male	1	0	2	0	1	4
	Female	3	3	4	2	0	12
50s	Male	2	3	3	1	0	9
	Female	0	0	0	0	0	0
Total		12	**15**	10	4	1	42

4.4.3 Teachers' Frog VLE Utilisation Factors

(a) Suitability for The Education System

Findings from the teacher survey in Fortran revealed that 24 respondents (57.1%) believed Frog VLE was capable of supporting the implementation of the education system such as the curricula and syllabi. Analysis from the teachers' interview sessions also suggested a similar finding. For example, Rosalind described that when explaining some Mathematical concepts to the students, she preferred to include some visual aids to assist the students' understanding. "When I teach topics such as 'Transformations', I need to show students the concept of 'rotation'. Many of the moderate or weak students cannot imagine if I just draw on the whiteboard and say "rotate like this...". So, I love to use the computer software and create some animations to help me explain to these students. I upload the animations on my (learning) site for the students' easy reference" (Rosalind, 23rd April 2018).

Meanwhile, as an English language teacher that prioritised the students' preparations to answer examination questions, Kareena highlighted that utilising the VLE platform enabled her to provide additional exercise questions in particular areas of weaknesses faced by most of her students. She highlighted the following,

> "My concern is all about the exam questions…For example, they are weaker in writing…So I give more homework questions on that. They are also weak in information transfer, so I give them to read short articles and comprehension questions" (Kareena, 23rd April 2018).

(b) Teacher-related Factors

As suggested by Clarke and Hollingsworth (2002) in the Interconnected Model of Teacher Professional Growth, teacher change partly occurred because the teachers had experienced or observed salient outcomes from an implementation or experimentation of a knowledge. The salient outcomes comprised of various forms including teacher satisfaction, teacher planning effectiveness and increased student learning. In Fortran, 26 respondents (61.9%) felt more motivated to utilise Frog VLE after observing outcomes deemed favourable to them. During the interview, Maggie highlighted that Frog VLE integration saved her a lot of time from having to rewrite Mathematical formula or draw graphs during classroom teaching and learning sessions. However, Maggie also reiterated that at the beginning stage of utilising the VLE platform, she actually spent a lot of time to prepare her teaching materials on her learning site. She described, "The first year was *very, very* difficult. I spent *a lot* of time…but after that it's really helpful. I don't have to spend so much time in preparation or rush through my lessons because the resources are there (on the learning site). I can implement my lessons comfortably" (Maggie, 23rd April 2018).

On a similar note, Rosalind agreed that the starting point of using the VLE platform was difficult for her. According to Rosalind, "At the beginning, it's very burdensome…But once everything is ready, you may relax, because the materials can be recycled. So, once I have my materials, I don't have to do much for the following year, just a little bit to suit my students' level" (Rosalind, 25th April 2018). Meanwhile, Kareena added that by virtually storing the educational materials on the learning site, she was able to save time and money from having

to find people or places to photocopy handouts for her teaching and learning purpose.

Nonetheless, Kareena admitted that her main reason for using the VLE platform was due to "pressure from the authority" (Kareena, 23rd April 2019). She explained that the school administrators and colleagues in the English Language panel consistently gave encouragements for the teachers to integrate the VLE platform for teaching and learning. Professional development sessions were regularly conducted to demonstrate to the teachers on how to integrate Frog VLE in teaching and learning. There was also a user manual to guide teachers with step-by-step instructions on how to use particular features in Frog VLE.

However, since the school administrators made it compulsory for teachers to submit their daily lesson plans and recommended the utilisation of the 'homework' feature, Kareena highlighted, "If these two (submitting lesson plan and utilising the 'homework' feature) are done, I'm happy about it. At least I'm using Frog VLE. Going beyond that…I still haven't got the motivation. I do a lot of activities in the classroom, only during my English language period. I don't go beyond school hours or do outdoor activities" (Kareena, 23rd April 2018). As described in 4.4.2 (c), Kareena assigned homework to her students via Frog VLE only during school holidays. Hence, Kareena's explanation regarding her main reason for utilising Frog VLE suggests that she is an example of an 'inadvertent user' based on the Teacher ICT Integration model proposed by Donnelly, McGarr, and O'Reilly (2011). An 'inadvertent user' is a teacher who involuntarily uses ICT in education due to external factors such as school culture and peer pressure (Donnelly et al., 2011).

Analysis from the teacher survey revealed a corresponding result in which 28 respondents (66.6%) indicated that they utilised the VLE platform to adhere to instructions from the superiors. In contrast, teachers such as Maggie and Rosalind explained that self-motivation and interest in ICT were the main factors influencing them to utilise the VLE platform for teaching and learning. Maggie (23rd April 2018) informed that she was aware of the benefit of keeping the educational resources in the virtual repository because she would be able to use them "every year". Rosalind disclosed that although she was not very IT savvy, she was always keen on exploring ICT softwares to draw images and creating 3-D animations for better illustrations of Mathematical concepts. Furthermore, Rosalind highlighted as follows,

> "I like to share with students and colleagues the materials I've prepared. I see this as a sharing platform as well. So that motivates me to do and share what I have. Also…this is some kind of my backup, a record of what I have done so far" (Rosalind, 25th April 2018).

In the meantime, the survey result in terms of the teachers' self-assessment on Frog VLE general utilisation skill demonstrated that 41 respondents (97.7%%) categorised themselves as having between low to advanced levels of competency. Only one respondent (2.4%) recorded 'no skill' at all. The majority of respondents in Fortran (22 respondents, 52.4%) rated themselves as having intermediate skill level (see Figure 26). Nonetheless, having the skill to utilise Frog VLE did not seem to translate into frequent actual integration of the VLE platform in teaching and learning. As discussed in 4.4.2 (a), the majority of respondents only integrated Frog VLE moderately, or once a month (see Figure 25) with a class that they were teaching. In addition, based on Figure 25, there were 9 respondents (21.4%) who recorded that they never utilised Frog VLE for

teaching and learning, despite the result in Figure 26 showing only one person with ‘no skill’ at all.

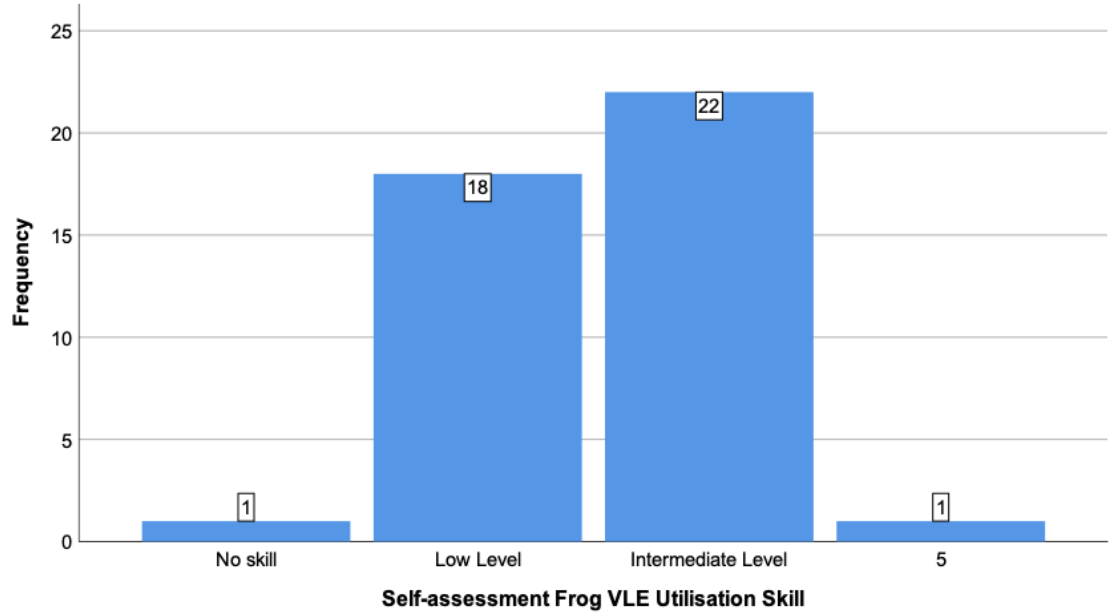


Figure 26: Fortran Teachers’ Self-assessment Regarding General Frog VLE Utilisation Skill.

A further scrutiny to the analysis results from the quantitative data suggest some first-order barriers that may have hindered the teachers from frequently utilising Frog VLE in teaching and learning. For example, only 15 respondents (37.7%) indicated that there was good internet connectivity in Fortran to enable access to the VLE platform. The other 27 respondents (64.3%) suggested otherwise. Similarly, Maggie and Rosalind also reported that they encountered with problems related to poor internet connection in the school. Although there were improvements from time to time, Maggie explained that one of the factors contributing to the reduced wi-fi performance in Fortran was because of the many concrete walls between the classrooms and the internet router devices.

Apart from internet connectivity, another barrier identified based on analysis from the teacher survey was related to time. Only 9 respondents (21.5%) reported that

they had enough time to prepare materials in order to conduct lessons that integrated the VLE platform while the majority of respondents in Fortran (33 respondents, 78.5%) had experienced some issues with regard to time management and VLE integration. To illustrate further, based on the qualitative data analysis with regard to barriers in terms of time, Rosalind explained, "I need materials, then only I can upload on my VLE site. I need time to prepare, time to upload, make it nice and make it work. I've to do trial and error before sharing with others…but there is limitation in terms of time because of school workload" (Rosalind, 25th April 2018). In addition, Kareena highlighted the following opinion regarding the matter,

> "I think for some teachers in certain subject panels, it's a norm for them to utilise the VLE…like myself for example…it's a very tedious job. You know…I would say it's taking up time to do everything…" (Kareena, 23rd April 2018).

(c) Student-related Factors

All three teachers who were interviewed in Fortran believed that integration of the VLE platform had benefited the students particularly in relation to its ability to be accessed at anytime and anywhere. Kareena emphasised that students did not have to depend on textbooks or desktops to do revision and homework because the VLE platform could also be accessed via smartphones. One of the students, Tan (25th April 2018) also highlighted the same advantage' "I like to have more lessons with VLE because I can study anytime and anywhere. So, if I want to study during the night, I can just login to Frog and study."

Meanwhile, Rosalind informed that one of the reasons she inserted videos on her learning site was to help the students focus on contents relevant to the topics outlined in the syllabus. According to her, "There are thousands of videos

available online, some are perhaps too detailed, too complicated and do not align with our syllabus. So, I selected a few videos and shared on my site. However, I still encourage them to continue surfing for other references or watching other videos if they have the time" (Rosalind, 25th April 2018).

In addition, Maggie informed that during her classroom teaching and learning sessions, sometimes it was difficult to ensure that all students understood the topics discussed because some of them were always quiet in class and probably shy to ask questions. Hence, Maggie preferred to share supplementary materials such as graphs or give assignments via her learning site so that the students could try at home. Lily, one of Maggie's students highlighted that studying with Frog VLE increased her interactions and discussions with her friends (see item 7 in Table 31). Not only that, Lily also indicated that she started asking more questions to her teachers because with Frog VLE, she was able to do supplementary exercises and read extra notes from a variety of resources.

As depicted on Table 31, students such as Arjun, Chloe, Krishna and Zara demonstrated that with access to Frog VLE, they gained better understanding of topics they studied in school. The students believed that reading supplementary notes, doing exercises and watching relevant videos gave them different perspectives as well as clearer interpretations of particular concepts and theories. Other reasons shared by the students regarding the advantages of integrating the VLE platform in their studies are displayed on Table 31.

Table 31: Fortran Students' Reasons for Enjoying the Utilisation of Frog VLE.

Item	Reasons	Students
1	**Assist understanding of topics**	Arjun, Chloe, Krishna, Zara
2	Less writing, just type the answers/assignments	Matthew
3	Reference to notes, teachers' presentations and other study materials	Lily, Kelvin
4	Less books (lighter bags, save money from having to buy books)	Harry, Matthew, Zara
5	Ability to study at anytime, anywhere	Tan
6	Preparation for university life	Harry, Lily
7	More interactions with teachers and students, more questions asked	Lily
8	References to school news, notices and announcements	Arjun
9	Lessons became more interesting	Chloe
10	Improve ICT skills	Liu Ying

Nonetheless, not all students interviewed in Fortran were keen on incorporating Frog VLE in their studies. For instance, Wong and Sanjay from Group 2 felt that they easily got distracted when doing revision or homework using Frog VLE or the computers in general because they spent more time surfing for other unrelated materials on the internet. Rosalind also expressed the same negative point related to distraction when she informed, "Sometimes when the students had completed their tasks and there was still extra time, they surfed for irrelevant or watched entertainment videos on Youtube. They made noise in class so it became a distraction to the others as well" (Rosalind, 25th April 2018).

4.4.4 Further Utilisation of Frog VLE for Teachers' Professional Practice

(a) Development of The Teachers' Learning Sites

Based on the teacher survey in Fortran, most of the respondents (21 teachers, 50.0%) regarded themselves as having low skill level in relation to development of their own learning sites. Referring to Figure 27, a total of 14 respondents (33.3%) stated that they had intermediate skill level and 6 respondents (14.3%) indicated that they had no skill at all.

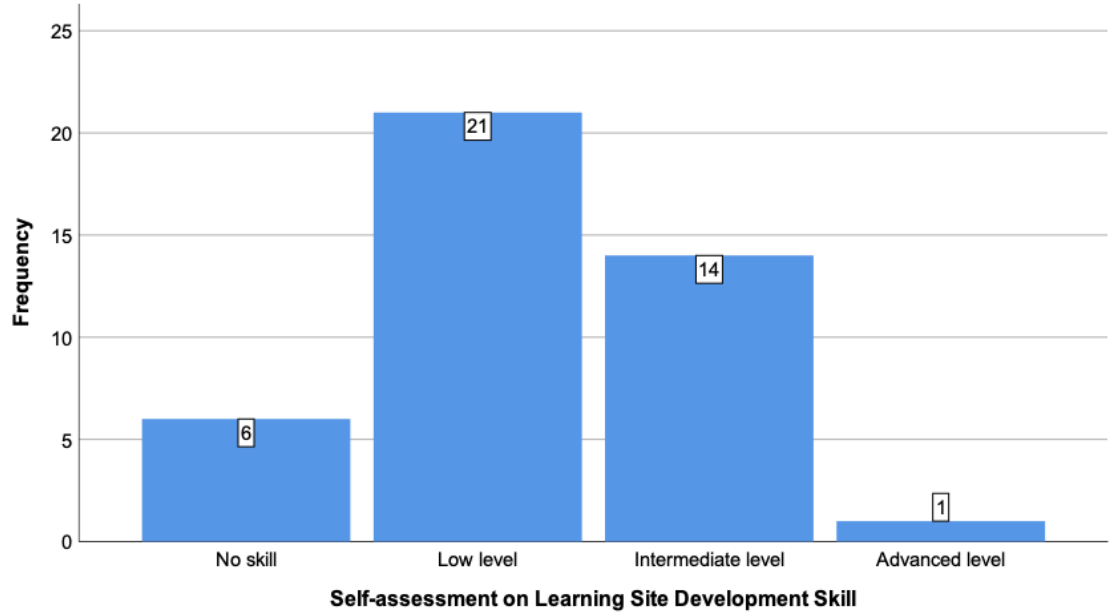


Figure 27: Fortran Teachers' Self-assessment on Learning Site Development Skill.

As portrayed in Figure 28, the majority of respondents (26 teachers, 61.9%) specified that at the time the survey was conducted they had developed between only 1 to 10 learning sites in Frog VLE. Meanwhile, there were 13 respondents (31.0%) who reported that they had developed zero (0) learning site. Thus, the result demonstrated that in Fortran, the extent of teachers' involvement in learning site development for Frog VLE was at moderate level.

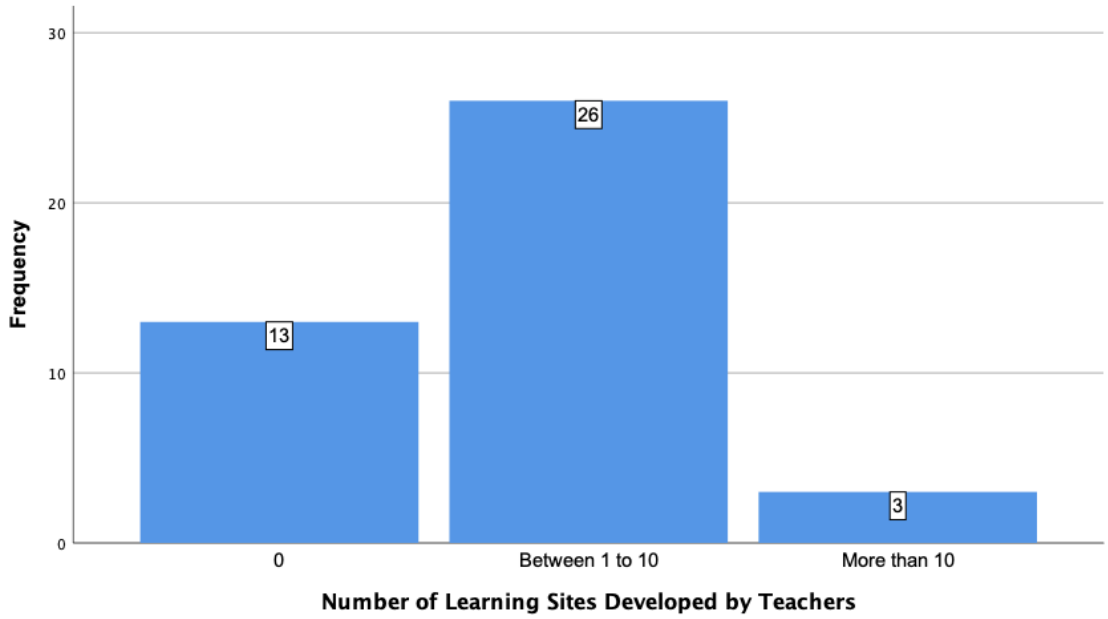


Figure 28: Learning Site Development (Fortran).

Comparing the results between Figure 27 and Figure 28, the number of respondents who reported that they had never developed any learning site was approximately double from the total respondents who recorded that they had no skill regarding how to develop the learning site. The difference in number between the total respondent who self-assessed themselves as having no skill (6 teachers) and those who revealed that they had never developed any learning site (13 teachers) suggested that apart from skill level, there were potentially other factors hindering the teachers from developing learning sites in Frog VLE. As discussed in 4.4.3 (b), problems associated with poor internet connection in the school and insufficient time for preparation of educational materials to be shared via the VLE platform could be among the obstacles faced by the teachers.

Based on Table 32, the result for the first item scored the highest percentage (47.6%). Thus in Fortran, the main reason behind the involvement of the respondents in developing learning sites was for them to diversify their teaching

approaches. According to Maggie, apart from the infrastructure in the computer laboratory, there were only a few classrooms in Fortran that were equipped with LCD projectors to facilitate teaching and learning with technology. Maggie highlighted, "When we use Frog (VLE), students will focus more, because it's different than the typical chalk and talk. That's important…because we vary the way we teach, and the way students learn. You've seen my class just now, they (students) were noisy but they were actually learning" (Maggie, 23rd April 2018). Meanwhile, the second highest reason for learning site development as depicted on Table 32 was for the teachers' own future reference with regard to teaching materials, useful links and a documentation of the students' work.

Table 32: Reasons for Learning Site Development (Fortran)

No.	Reasons	Frequency	Percent
1	**To diversify teaching approaches**	20	47.6
2	For own future teaching reference	17	40.5
3	To share lesson plans with other teachers	9	21.4
4	For students' independent learning	13	31.0
5	To achieve lesson objectives	13	31.0

In relation to the learning site development widgets available in Frog VLE, results from the teacher survey showed that the respondents in Fortran most commonly used the 'file drop' widget to upload or download files and documents. A total of 33 respondents (78.5%) had been using the 'file drop' widget whilst utilising the VLE platform. The second highest utilisation rate among the respondents in Fortran was for the 'media' widget (28 teachers, 66.7%). Maggie and Rosalind were two examples of teachers in Fortran who frequently incorporated the 'media' widget to embed images and videos to their learning sites. In contrast, the forum widget that was part of the communication features in Frog VLE was only utilised by 18 respondents (42.9%), which made it among the unpopular widgets in Frog

VLE. This further highlighted the earlier findings regarding lack of utilisation of Frog VLE for communication purpose as elaborated in 4.4.2 (b) and 4.4.3 (c).

(b) Utilisation in Other Areas

Apart from being utilised for teaching and learning, Frog VLE was also used in Fortran for other purposes. Teachers used it to facilitate their administrative tasks while students accessed the VLE platform to get up-to-date information regarding school activities, announcements and other information related to their studies. All teachers in Fortran were required to submit their daily lesson plans to the Principal via the Google Drive link that was embedded in Frog VLE. Furthermore, Maggie informed that her Mathematics subject panel created a site in Frog VLE to share relevant materials such as the annual Strategic Plan, syllabus, paperwork and reports. The site for this subject panel was only accessible by the teachers and school administrators.

As the school's VLE platform coordinator, Maggie also informed that she created a Student Noticeboard in Frog VLE to post news and relevant information regarding school activities. In addition, she also shared updated information regarding scholarships and universities as reference for the Form 5 (final year) students. Analysis from the students' group interviews revealed that Lily and Arjun were among the students who regularly accessed the VLE platform to look for information and announcements especially regarding the scholarships. In the meantime, Kareena highlighted that as advisors for the English language society and Cheerleading club, she ensured that her student committee utilised Frog VLE to manage registrations, make announcements and upload photos of activities.

4.4.5 School Highlights and Frog VLE Implementation Challenges

Based on analysis from the interview with the Senior Assistant (Academic Affairs), it became evident that the school administrators in Fortran acknowledged the importance of incorporating the VLE, both for teaching and learning as well as for the teachers' administrative purposes. The school had organised series of courses and CPDs for the teachers and students. The teachers were also exposed on how to utilise particular features available in Frog VLE. Furthermore, the school, in collaboration with the Parent-Teacher Association (PTA) had secured a donation of computers from a private multinational ICT company in order to provide more access to the VLE platform within the school compound.

The school also gave monthly recognitions to teachers and students who were frequent users of Frog VLE but according to Maggie, it was always the same teachers who got the awards. Hence, to encourage more teachers to further explore Frog VLE and be able to diversify the content of their learning sites, CPD sessions were held every year regarding how to utilise the different features in the VLE platform. Nonetheless, the senior assistant and Maggie both highlighted that there were still many teachers in Fortran who did not spend time after the CPD sessions to practise developing their own learning sites or utilising Frog VLE in general. Therefore, the VLE utilisation level among the teachers in Fortran remained moderate, while many of the available widgets in Frog VLE were still underutilised by many of the teachers. Despite actively utilising Frog VLE and developing her own learning sites, Rosalind admitted that she typically only used several widgets from the VLE platform. She highlighted, "I usually apply widgets

like the media, to download or upload videos…I think I've used less than 50% from the available widgets" (Rosalind, 25th April 2018).

Another Frog VLE implementation challenge highlighted by the senior assistant was associated with the students' daily routine. As highlighted in 4.4, the students in Fortran mostly came from middle to high-income families. Many of the students' parents held high-level professional careers such as specialist doctors, lawyers and corporate leaders. Although at home the students typically had better access to ICT and the internet, many were hampered by their tight schedules after school hours or during weekends with tuition classes and extra co-curricular lessons. It was common for students in the area to attend paid tuition classes to ensure that they excel academically. Apart from that, many students also took part in extra co-curricular sessions not offered in Fortran such as ballets and piano lessons.

The senior assistant added, "Our students are also very practical. If they think something is useful, they will have a look at it…If the teacher uses the VLE… just for the sake of using it, the students won't appreciate…Many of our students don't even want to play the games in Frog Play. I think they are more exam-oriented. They always want to get good results, good grades" (Senior Assistant, 30th July 2018). The following response by Arjun, a student in Group 2 reflects the opinion highlighted by the Senior Assistant regarding exam-oriented students. Arjun was commenting on the opportunities to play games in Frog Play as well as doing group tasks using the VLE platform. He emphasised,

> "It's fun, we get to interact but sometimes it can be a waste of time. If it's in Form 4, Form 2 or Form 1…not very important years (no major pubic examinations), then that will be a fun way to interact in class, and for school to be more fun for students. However to me, exam is more important, it's priority" (Arjun, 4th May 2018).

With regard to the ICT Integration model, the senior assistant believed all four categories of teachers were present in Fortran. The senior assistant suggested that when considering the utilisation of the VLE platform in general, most of the teachers in Fortran were Inadvertent Users since it was compulsory for them to submit their daily lesson plans to the school Principal via Frog VLE. However, when discussing the utilisation of the VLE platform specifically for teaching and learning, the senior assistant believed that there were still many teachers in Fortran who were in the category of Contented Traditionalist. He elaborated the following,

> "As for the Contented Traditionalist, I think we may still have about half of the teachers' population here. Well, if we're only talking about using the VLE for teaching and learning purposes, the teachers usually say they need computers. Some teachers think they need a classroom with an LCD projector. So, with limited facilities available in this school, it's troublesome" (Senior assistant, 30th July 2018).

Kareena, the teacher who integrated the VLE platform for teaching and learning only during school holidays was an example of a teacher in Fortran who preferred to have more ICT infrastructure in the school. She believed that booking the designated classrooms was quite tedious. In addition, she suggested that if the school was able to equip each classroom with suitable ICT equipment, teachers and students could save time from having to walk to the computer laboratory or designated classrooms with ICT facilities.

4.4.6 Summary of Findings for Fortran

Findings from the case study in Fortran revealed that actual utilisation of Frog VLE by teachers who took part in the study was at moderate level. Analysis from the qualitative data suggests that the participants in this school (including some

of the students) placed high importance on gaining academic excellence. Meanwhile, results from the teacher survey indicated that majority of the respondents in Fortran believed the VLE platform was capable of supporting the curriculum, syllabi and the students' assessments. On that note, most of the participants in Fortran utilised Frog VLE in teaching and learning because they wanted to provide the students with additional resources to enhance understanding of topics. Indeed, results from the qualitative data analysis involving the students portrayed that the supplementary resources such as notes, slides, videos and exercises helped them gain better understanding whilst also preparing the students for their assessments and examinations. Although most of the teacher participants utilised the VLE platform to give notes, assign homework and assignments to the students, the quantitative and qualitative data analyses revealed that the feedback to students mostly occurred during whole class face-to-face interactions. One of the reasons cited for the preference to give feedback during whole class face-to-face sessions was to save time in explaining to the students regarding answers to the exercise questions.

Based on the survey, the participating teachers' involvement in developing learning sites within Frog VLE was also at a moderate level. Most of the teachers developed their learning sites to diversify their teaching approaches. The teachers' survey result indicated that half of the respondents had low skill level with regard to learning site development. Many of the available widgets in Frog VLE were still not optimised by the participants in Fortran. Analysis from the quantitative and qualitative data suggested that skill level, poor internet connection and time constraint were among the factors hindering the teachers from developing learning sites in the VLE platform.

In addition, the majority of participants in Fortran admitted that they utilised the VLE platform to adhere to instructions from their superiors. One of the teachers interviewed described that her main reason for using Frog VLE was because of pressure from the authority. Hence, as Inadvertent Users, such teachers utilised the VLE platform involuntarily and typically for specific purposes as dictated by the school administrators, such as to submit their daily lesson plans. However, with regard to integration of the VLE platform particularly for teaching and learning, the senior assistant in Fortran believed that many teachers in the school were in the category of Contented Traditionalist. Nevertheless, some other participants in Fortran demonstrated that they progressed from utilising Frog VLE because of instructions, to self-motivation after witnessing or experiencing results deemed favourable to them. Two of the teacher participants highlighted that although integration of the VLE involved hard work at the beginning, they were able to gain benefits once they had uploaded their teaching and learning materials on the learning sites because the resources could generally be recycled every year.

4.5 Pixel

Pixel was a regular post-primary national school located in a rural area approximately 150 kilometres northwest from Shah Alam, the capital city of Selangor state. Pixel was a co-educational school focusing on Islamic studies. The school was originally supervised by the Selangor state administration but in 2006 the Federal government via the MoE took over its management to ensure standardisation in various fields especially the students' curriculum, assessments and access to educational resources. With only 374 students and 38 teachers

(including school administrators) at the time of data collection, Pixel was the smallest school involved in this multiple-case study. Student enrolments into Pixel were mostly from the surrounding areas, in which most of the parents and guardians worked as farmers and fishermen. Hence, many of the students in Pixel came from low to middle income families. As a regular post-primary national school in a rural area, there was a hostel facility in Pixel but was only limited to cater for the female students. According to the senior assistant, there were demands to establish dormitories for the male students, but financial constraints delayed the process to build a new block of student hostel.

4.5.1 Participants' Demographic Information

A total of 32 respondents participated in the teacher survey. Despite having access to the online survey, all of the 32 respondents answered the questionnaire using the hardcopy version. The majority of respondents were female (20 teachers, 62.5%) and 12 (37.5%) respondents were male teachers, as portrayed in Figure 29. Statistics from the Selangor State Education Department indicated that at the time of data collection, there were 802 (66%) female teachers and 409 (34%) male teachers in post-primary schools around Sabak Bernam district which was within Pixel's locality (Jabatan Pendidikan Negeri Selangor, n.d.).

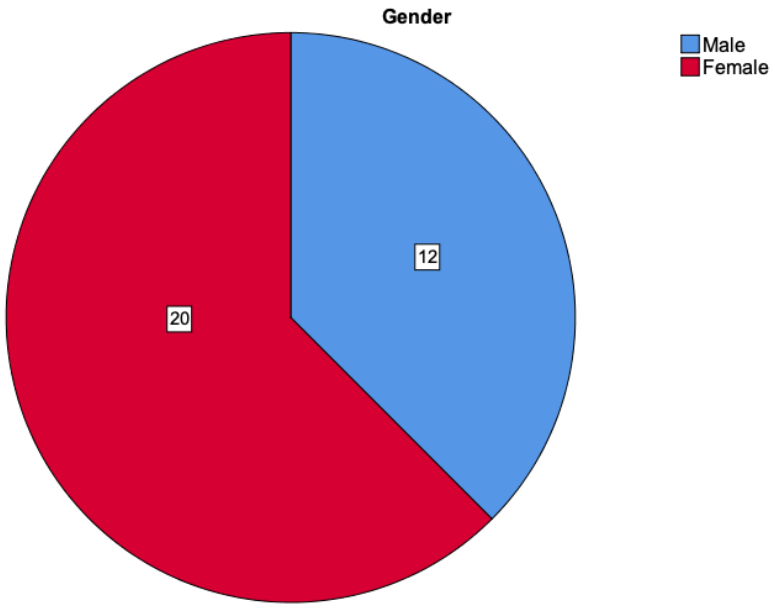


Figure 29: Respondents' Gender Distribution (Pixel).

The youngest respondent in the teacher survey was 26 years old and the oldest was 58 years old as depicted below.

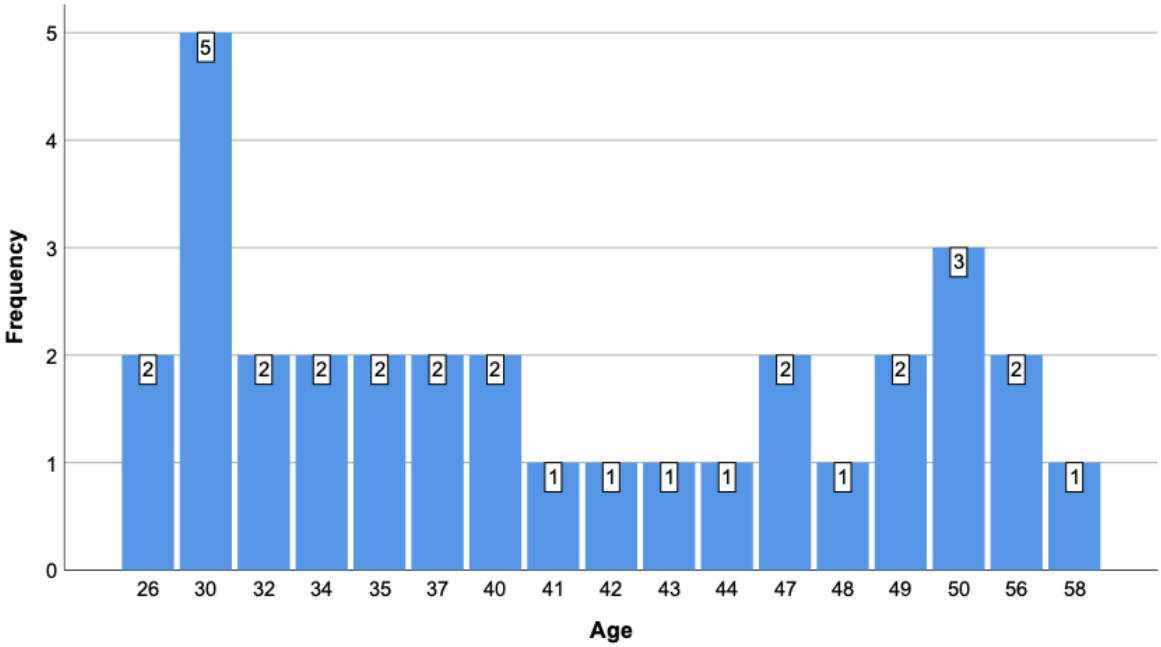


Figure 30: Respondents' Age Distribution (Pixel).

A summary of the subjects taught by the respondents is portrayed below.

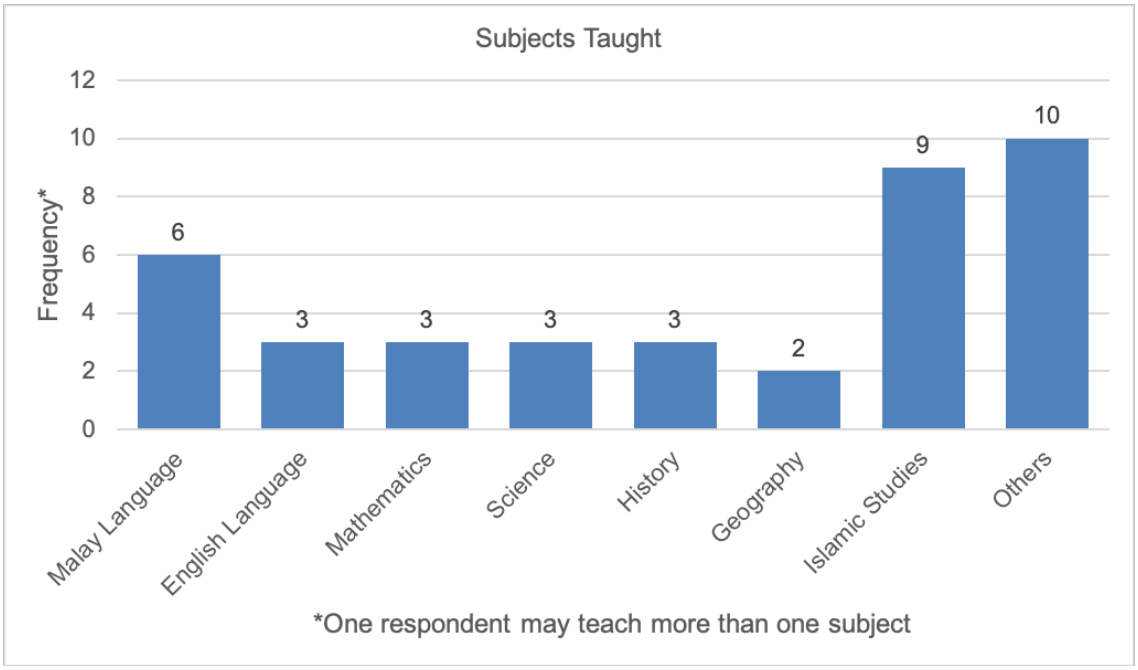


Figure 31: Subjects Taught by Respondents in Pixel.

In relation to experience with Frog VLE, the range of years varied from one (1) year to 5 years as displayed in Table 33.

Table 33: Year (s) of Experience Utilising Frog VLE (Pixel).

Number of Years	Frequency	Percent
0	0	0.0
1	4	12.5
2	8	25.0
3	13	40.6
4	3	9.4
5	4	12.5
6	0	0.0
Total	32	100.0

In the meantime, all three participants who took part in the interview sessions were teachers representing the 40s age group. One participant was a male teacher teaching Mathematics subject for the Upper Secondary (16 and 17 years old students). The other 2 participants were female teachers. Table 34 represents a summary of the three teachers' demographic information and pseudonyms

used for this study. Wardina taught Islamic studies to the Lower Secondary students. In addition, Wardina also taught Al-Quran and As-sunnah studies to the Upper Secondary students. Meanwhile, Dewi taught English language to the Lower Secondary (Forms 1, 2 and 3) students.

Table 34: Pixel Teacher Pseudonyms and Demographic Information.

Teacher & Pseudonym	Gender	Age group	Years of teaching experience	Subjects taught in Pixel
Teacher 1: Ismail	Male	40s	14	Mathematics.
Teacher 2: Wardina	Female	40s	15	Islamic studies, Al-Quran and As-sunnah studies.
Teacher 3: Dewi	Female	40s	23	English language.

A total of 12 students in Pixel were interviewed regarding their experience with Frog VLE. Table 35 displays a summary of the demographic information and pseudonyms of the students.

Table 35: Demographic Information and Pseudonyms of Pixel Students Involved in the Interview Sessions.

Student Group Number	Age & Class / Level	Gender	Count	Pseudonyms
One	17 years old, Form 5	Boys	1	Farid
		Girls	3	Jasmine, Aafiyah, Wendy
Two	16 years old, Form 4	Boys	0	
		Girls	4	Hawa, Suraya, Afikah, Farah
Three	17 years old, Form 5	Boys	0	-
		Girls	4	Nurul, Fatimah, Gina, Yanti
Total number of students			12 students (1 boy, 11 girls)	

4.5.2 Teachers' Actual Utilisation of Frog VLE for Teaching and Learning

(a) Frequency of Integration

Based on the survey conducted in Pixel, 17 respondents (53.1%) reported that they integrated Frog VLE for teaching and learning with their students approximately once a month. Another 6 respondents (18.8%) indicated that the utilisation of Frog VLE occurred between 2 to 8 times per month. However, there were still 9 respondents (28.1%) in Pixel who had never integrated Frog VLE in the lessons they conducted with their students. The detailed results are presented in Figure 32.

Referring to Figure 31, there were 9 respondents (28.1%) who taught Islamic studies (3 hours per week for each class of students). Six respondents (18.8%) Malay language (4 hours per week) and 10 respondents (31.3%) taught other subjects such as Al-Quran and As-Sunnah studies, Islamic Sharia law and Arabic language (3 hours per week). The statement in the questionnaire required the teachers to make reference to any one particular class that they were teaching in Pixel when indicating the frequency of Frog VLE integration. Hence, based on the TALIS average of 17 teaching hours per week for Malaysian teachers, it was possible that a respondent who utilised Frog VLE once a month for teaching and learning was actually integrating the VLE platform between 4 to 6 times per month with all the taught classes. Therefore, the actual utilisation of Frog VLE for teaching and learning as reported by the respondents in Pixel was at a moderate level.

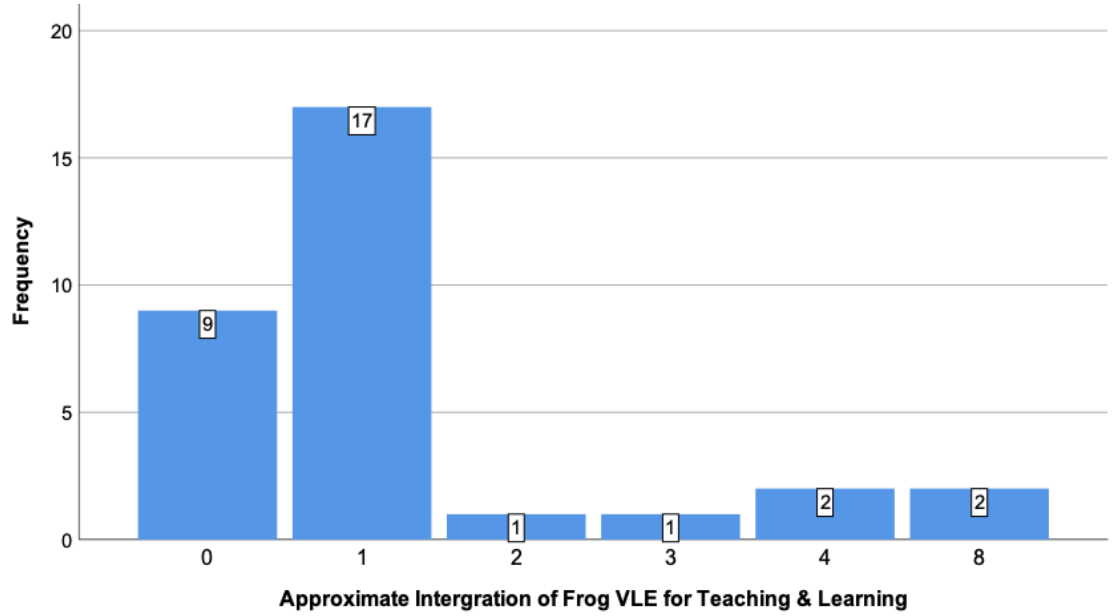


Figure 32: Approximate Integration of Frog VLE for Teaching and Learning in Pixel (per month).

The result from Spearman's Rank Order (rho) correlation test between age and actual Frog VLE utilisation yielded an r_s = -.274 and p > 0.01. The correlation coefficient (r_s) value indicated a negative relation, to suggest that the younger the respondents' age, the higher the utilisation of Frog VLE. However, the amount of -.274 suggested only a weak correlation, depending on the result of the Sig. (p-value). Since the p-value was higher than 0.01, there was generally no evidence to correlate between age and actual Frog VLE utilisation among the respondents in Pixel. In other words, age did not contribute much to the extent of actual Frog VLE utilisation among the respondents in Pixel.

(b) Utilisation of Specific Features in Frog VLE

In relation to the features in Frog VLE, the results in Table 36 indicate that the respondents in Pixel mostly used the VLE platform to assign homework to their students. The 'assign homework' attribute scored the highest mean (1.09) among

the list of Frog VLE features included during the survey. Although 15 respondents (46.9%) indicated that they never assigned homework to their students via Frog VLE, the remaining 17 respondents (53.2%) reported that they utilised the VLE platform to give homework or assignments to their students.

Table 36: Actual Utilisation of Specific Features Available in Frog VLE (Pixel).

No.	Survey Item	Never		Once a month		Once a week		More than once a week		Mean
		f	%	f	%	f	%	f	%	
1	Teacher assigns homework to students	15	46.9	14	43.8	1	3.1	3	6.3	1.09
2	Teacher utilises Frog VLE to give feedback to students about homework	20	62.5	12	37.5	0	0.0	0	0.0	0.75
3	Teacher communicates with students' parents via Frog VLE	31	96.9	1	3.1	0	0.0	0	0.0	0.06

Legend: f (frequency), % (percentage).

Based on Table 36, the majority of respondents (20 teachers, 62.5%) reported that they never utilised the VLE platform to give feedback regarding their students' homework compared to the other 12 respondents (37.5%) who indicated that they used the VLE feature with their students once a month. In a related question included in the survey, 19 respondents (59.4%) suggested that their students also never utilised Frog VLE to submit homework to the teachers. In other words, only 13 respondents (40.7%) reported that their students submitted homework via the VLE platform. The survey results also suggested that the features enabling communication to occur via Frog VLE were least utilised by the respondents. For example, in terms of teacher-student communication, most of the respondents (18 teachers, 56.3%) indicated that they

never utilised Frog VLE to communicate with their students. Although 14 respondents (43.7%) reported that communication with their students did occur via Frog VLE, the extent was either 'rarely' or only 'sometimes'. In addition, as presented in Table 36, a great majority of respondents (31 teachers, 96.9%) indicated that they never used Frog VLE to communicate with the students' parents. This was possibly due to the problem with internet connectivity because Pixel was situated in a rural area. Hence, the lack of internet connection was an obstacle for communication via the VLE platform.

(c) Application of Frog VLE for Teaching and Learning in Pixel

The results from a cross-tabulation analysis between gender, age groups and main purpose for Frog VLE utilisation revealed that in general, the respondents in Pixel integrated Frog VLE in teaching and learning mainly to provide their students with additional resources in order to enhance understanding of topics. The next common reason for the integration of the VLE platform was to provide supplementary materials as well as test students' understanding of topics (refer items (i) and (ii) in Table 37). Based on analysis from the qualitative data, the three teachers who were involved in the interview sessions demonstrated that they utilised the VLE platform mainly for reason number (ii) in Table 37 (to provide additional resources and test students' understanding). For example, Ismail explained that for his Mathematics subject, he usually prepared exercise questions on his learning site in Frog VLE. The exercise questions were formulated according to topics based on the Mathematics syllabus and assigned to the students either as homework or discussions during face-to-face classroom sessions. Ismail added that he also frequently utilised the Quizziz section in Frog VLE to enrich students with different types of exercise questions. Other than that,

Ismail highlighted that most often when he had the opportunity to bring his class to the ICT laboratory, he would let the students access the VLE platform to answer Mathematical quizzes via Kahoot!, a game-based learning platform for a variety of subjects.

Meanwhile, Wardina explained that she usually integrated Frog VLE to provide supplementary resources to her students for several reasons. According to her,

> "I don't use Frog VLE to the optimum. The first reason is time constraint. In this school, the time allocation for one period of teaching and learning session is 30 minutes…the (internet) line is sometimes okay but sometimes slow. Thus, it interferes with the classroom time management too. For those reasons, I mostly used Frog VLE to provide supplementary resources and exercises that students can read or access at any other time" (Wardina, 31st May 2018).

Likewise, the researcher had the opportunity to observe one of Dewi's English language lessons with her Form 2 students. Although she was able to incorporate Frog VLE during the one period session, utilisation of the VLE platform also reflected purpose (ii) as indicated in Table 37. Due to the limitation in terms of time, activities during the observed lesson included Dewi's explanation regarding the topic, followed by a comprehension exercise completed individually by the students based on an article shared via the teacher's learning site in Frog VLE. During the classroom session, there was insufficient time to implement any 21st century teaching and learning activities that reflect items (iii) or (iv) as indicated on Table 37.

The results in Table 37 showed that most of the respondents were from the 30s and 40s age groups, hence suggesting that most of the teachers in Pixel were in the 30s or 40s. Nevertheless, with regard to the types of uses of the VLE

platform, only 2 respondents (one from each age group) indicated that they incorporated Frog VLE to conduct 21st century teaching and learning activities with the students (see item (iii) and (iv) in Table 37). Hence, this suggests that the majority of respondents in Pixel were more inclined to integrate the VLE platform in the traditional, teacher-focused and content-oriented approach as emphasised by Lameras, Levy, Paraskakis and Webber (2012) when describing the four categories of VLE use (outlined in Table 37 via labels (i), (ii), (iii) and (iv)).

Table 37: Cross-tabulation analysis between gender, age groups and their main purpose for integration of Frog VLE (Pixel).

Age groups	Gender	Not applicable	(i) To provide additional resources	(ii) To provide additional resources and test students' understanding	(iii) To allow students to further explore topics and express opinions (discussions & debates)	(iv) To allow students for further exploration of topics, collaborate in groups and present new discoveries	Total
20s	Male	0	0	0	0	0	0
	Female	1	1	0	0	0	2
30s	Male	0	2	0	1	0	3
	Female	2	5	3	0	0	10
40s	Male	2	2	2	0	0	6
	Female	1	1	2	0	1	5
50s	Male	2	1	0	0	0	3
	Female	2	1	0	0	0	3
Total		10	13	7	1	1	32

4.5.3 Teachers' Frog VLE Utilisation Factors

(a) Suitability for The Education System

Analysis from the teachers' interview sessions suggests that one of the factors influencing the utilisation and integration of Frog VLE in teaching and learning was due to its relevance in supporting the curriculum, subject syllabi and students' assessments. For example, as highlighted in 4.5.2 (c), Ismail formulated exercise questions for his Mathematics subject according to topics based on the syllabus. He added,

> "Yes, this subject involves students to show their Mathematical work solutions, but I don't see any problem with integrating the VLE platform. If we do an activity with Kahoot! there is a set time for students to answer the questions…they record their answers on the computer. I usually discuss the work solutions with my students after the Kahoot! session. So, students use the opportunity to check their understanding of the topic and also practise answering the questions within a specified time, just like during examinations" (Ismail, 31st May 2018).

In the meantime, Wardina believed that suitability of the VLE platform to support the education system depends on the teachers' creativity. The creativity is related to when and how the teachers decide to utilise the VLE platform for the purpose of teaching and learning. Wardina's opinion correlates with the Technological, Pedagogical and Content Knowledge (TPACK) framework by Koehler and Mishra (2009), whereby a teacher needs to be competent in the three areas of knowledge in order to reach the creativity level as highlighted by Wardina, hence to be able to efficiently integrate ICT to support teaching and learning. In relation to the subjects that she taught in Pixel, Wardina described that she took into consideration several factors including the suitability of VLE integration with the topics. According to her,

> "For my subjects, there are some topics that we can't only use technology. For example, Islamic religious studies involve practical work. The students need to practise and master certain things such as how to

> perform the daily prayers or recite the Al-Quran so that they can apply it in life" (Wardina, 31st May 2018).

Wardina also highlighted that in terms of suitability, the only challenge she faced was the lack of educational materials in Frog VLE and other educational websites. Hence, equipped with her content and pedagogical knowledge as well as her skills in utilising Frog VLE, she created her own materials that she shared with her students via her learning site. Wardina highlighted that she also selected some available materials from non-educational resources especially related to Al-Quran and As-sunnah, to be shared with her students for their knowledge enrichment.

(b) Teacher-related Factors

Based on the teacher survey, 18 respondents (56.3%) indicated that they felt more motivated to utilise Frog VLE after observing outcomes regarded as favourable to them. To illustrate further, Wardina emphasised that utilisation of the VLE platform helped to increase her ICT skills, encouraged her to be more creative in teaching and learning, hence diversifying her teaching methods to suit her students' levels. Meanwhile, Ismail explained how Frog VLE integration enabled him to implement 21st century teaching and learning pedagogy. His role was to facilitate the students' group activities such as in exploring the VLE platform to search for relevant Mathematical formula, and during discussion of answers to the exercise questions. Ismail added that another benefit of Frog VLE integration in teaching and learning was that "I don't have to write so much anymore (*laughing*)" (Ismail, 31st May 2018).

Ismail admitted that the main motivation for him to utilise the VLE platform were because of self-interest and satisfaction from witnessing salient outcomes from the integration of Frog VLE in teaching and learning. He emphasised that after attending the CPD session regarding how to integrate Frog VLE, he became interested and felt urged to try it with his students. “Once I tried it, I saw that the students’ response was very good, so I continued ever since!” (Ismail, 31st May 2018). Similarly, Dewi expressed that she enjoyed utilising Frog VLE because in general it helped to ease her teaching process.

> “When I logged in and started doing my site, I found it interesting. So, I started to do more…because it makes my teaching easier. My students and I can easily refer to the teaching and learning resources…can refer to almost everything, from notes, examples, past year questions and quizzes!” (Dewi, 2nd July 2018).

In contrast, based on the teacher survey, 16 respondents (50.0%) reported that they utilised Frog VLE to adhere to instructions from the superior. Analysis from the teacher’s interview revealed that Wardina began to use Frog VLE initially because of the circular from the MoE. Wardina highlighted that she felt compelled to start utilising Frog VLE to show support to the school’s VLE coordinator and administrators. Nonetheless, after several years of utilising Frog VLE, Wardina admitted that she felt more comfortable and began to integrate the platform voluntarily. She highlighted,

> “When you are already good at it, you start seeing the results. When I use it with my students, I see them looking happy and more engaged, so I feel happy too. Furthermore, for us the religious studies teachers, it is an achievement, sort of a cutting edge element there, so we feel proud and happy” (Wardina, 31st May 2018).

Apart from observing or self-experiencing salient outcomes from the integration of the VLE platform, another factor that influenced the utilisation was related to

the teachers' ICT skills. As elaborated in 4.5.3 (a), it is important for teachers to have pedagogical, content as well as technological competencies in order to successfully implement lessons with technology integration. With regard to the teachers' self-assessment of Frog VLE general utilisation skill, the survey result in Pixel demonstrated that 26 respondents (81.2%) categorised themselves as having between low to advanced levels of competency. Half of the respondents (16 teachers, 50.0%) rated themselves as having intermediate skill level. Six respondents (18.8%) believed that they had no skill at all (refer Figure 33).

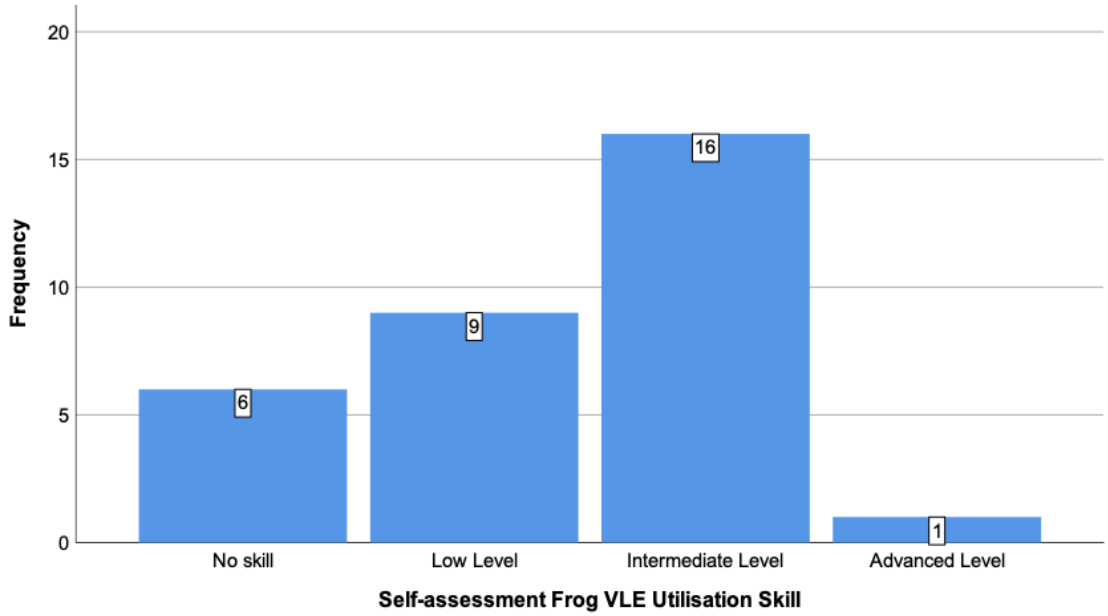


Figure 33: Pixel Teachers' Self-assessment on Frog VLE General Utilisation Skill.

Nonetheless, there was a difference in the results between the number of respondents who indicated that they had no skill on how to use Frog VLE (see Figure 33) with the number of respondents who admitted that they had never integrated Frog VLE for teaching and learning (see Figure 32). Although only 6 respondents recorded that they did not know how to use Frog VLE, there were 9 respondents who reported that they had never utilised Frog VLE for teaching and learning. Therefore, having some knowledge and skills on how to utilise the VLE

platform did not necessarily translate into actual integration into teaching and learning.

Findings from the case study in Pixel suggested that time was a factor hindering teachers from utilising Frog VLE for teaching and learning. For example, based on the teacher survey, 17 respondents (53.2%) recorded that they did not have ample time to prepare materials for Frog VLE integration. In addition, 11 respondents (34.4%) decided to remain neutral and chose 'not sure' as their response for the same statement regarding preparation time. Referring to the qualitative data analysis, although Ismail was a frequent user of Frog VLE, he also expressed some laments regarding time.

> "Actually, I do mind (*laughing*)…it uses a lot of time, especially like myself I have my young children at home (*laughing*). It's definitely time consuming because a lot of materials are not suitable. I usually spent time to devise my own resources or modify existing materials to suit my students and my (teaching) style" (Ismail, 31st May 2018).

Meanwhile, 15 respondents (46.9%) indicated that there was insufficient time for them to conduct lessons that integrate the VLE platform during school hours. As highlighted by Wardina in 4.5.2 (a), the time allocation for a lesson period in Pixel was 30 minutes, making teaching and learning with VLE integration a challenge for the teachers, especially during periods of slow internet connectivity. Ismail (31st May 2018) described, "Quite often when there's internet problem, the frog (logo) kept rotating. Buffering sometimes took 15 minutes and we sometimes only had half an hour…only a few questions done, and the next teacher was already outside knocking on the door (*laughing*)". Nonetheless, teachers such as Ismail, Wardina and Dewi did not consider the time constraint as a major barrier that hindered them from utilising Frog VLE in teaching and learning. Instead, they

optimised on the VLE's concept of learning at anytime and anywhere to share educational resources and assign homework to their students.

(c) Student-related Factors

The Interconnected Model of Teacher Professional Growth suggested that teachers change partly after observing or experiencing favourable outcomes associated with themselves or their students, as a consequence of experimenting a change proposal (Clarke & Hollingsworth, 2002). Results from the qualitative data analysis in Pixel indicated that the teacher participants became more motivated to utilise Frog VLE after gaining favourable reactions from the students. For example, Dewi highlighted that she noticed her students enjoyed their lessons more with Frog VLE integration. "I also get feedback from my students. They like doing work using Frog VLE" (Dewi, 2nd July 2018). Table 58 displays some of the students' responses regarding the reasons they enjoyed utilising the VLE platform as part of their teaching and learning experience.

Based on Table 38, many students cited that they enjoyed the opportunity to do revision whilst playing games via the VLE platform (see item 1). Below are some quotes given by the students regarding educational games accessible via Frog VLE.

> Jasmine (31st May 2018): "There are games for revision. We play a game. We answer the question, then we get to continue playing the game. Then another question comes up, and so on. It's an interesting way to learn".
>
> Wendy (31st May 2018): "When there are games, I don't feel so stressed. I get two things, fun and learning!
>
> Afikah (31st May 2018): "When we do Kahoot! or Quizziz, we don't feel too bored. It's interesting because anyway, the questions are related to what we learn in our subjects. So yeah, we do learn, and play at the same time!

Gina (2nd July 2018): “Previously I was weak in Al-Quran and As-sunnah subject. However, with the VLE, I read more online notes, and answer a lot of Quizziz and play the games. Before exam time, I repeat the Quizziz, FrogPlay and Kahoot! and I was able to remember better!”

Table 38: Pixel Students’ Reasons for Enjoying the Utilisation of Frog VLE.

Item	Reasons	Students
1	**Not boring, provided fun alternative in doing revision (via educational games i.e. Kahoot!, Quizziz, FrogPlay)**	Jasmine, Wendy, Aafiyah, Suraya, Afikah, Hawa, Fatimah, Yanti, Gina
2	Online textbook (don’t have to carry heavy books)	Jasmine
3	Easier to do revision (online reference to notes, teachers’ presentations and other study materials)	Jasmine, Aafiyah, Wendy, Gina, Nurul
4	Assist understanding (diversity of resources to suit students’ learning styles)	Farid, Aafiyah, Afikah, Fatimah
5	Preparation for university/future	Fatimah
6	Cloud storage (eased management of educational materials, safe storage)	Jasmine
7	Increased communication with teachers	Fatimah, Yanti

In an interview with the school’s VLE coordinator, she highlighted that in the school, there were several occasions whereby teachers integrated the VLE platform after some persuasion from the students. The coordinator explained that some teachers in Pixel utilised Frog VLE for teaching and learning each time it was their turn to bring their students to the computer laboratory. The students observed how those teachers managed the steps (such as in conducting Kahoot! or Quizziz) with the whole class. As a result, the students became familiar with the procedures. If the teacher for the next lesson did not use Frog VLE, the students would try to influence the teacher to use the VLE platform.

> "They would say "teacher let's do this using Frog VLE". Usually after some time, the teacher would give in and say, "okay fine… you show me". Basically, students are more than happy to show the teachers how to use Frog VLE…in some cases, the students would end up helping or collaborating with the teachers to do activities involving the VLE platform" (VLE coordinator, 31st May 2018).

The explanation from the VLE coordinator also portrayed that in some situations, there was an increase in communication between the teachers and students in Pixel with the implementation of Frog VLE. During the teacher interview, Ismail also agreed that the extent of communication between himself and his students, as well as interactions among students had elevated with the integration of the VLE platform in teaching and learning. He elaborated as follows,

> "The students are active…that usually means they are interested. When they are interested and more focused in the lesson, they have a lot of questions that they always ask me for clarifications! Compared to the traditional method whereby they usually just sit quietly, we don't know whether they understand or not!…there is a lot of communication among the students. They discuss…noisily, active! In this computer lab with VLE, everybody wants to get involved, they designate among themselves, who searches for formula and gives ideas, who presses the answers on the computer" (Ismail, 31st May 2018).

Nevertheless, another student-related factor also affected the teachers' decision regarding Frog VLE utilisation for teaching and learning in Pixel. Since the school was located in a rural area, access to the VLE platform outside the school compound, in particular when the students were at home, became an issue. Based on the teacher survey, most of the respondents (18 teachers, 56.3%) were not sure whether the majority of their students had suitable access to the VLE platform outside the school compound. Eight respondents (25.0%) believed that their students did not have appropriate access to Frog VLE outside the school. An analysis from the qualitative data suggested that the participants were aware of the predicaments faced by some students regarding lack of internet access

outside the school. For example, Wardina explained that when she shared notes or assigned homework to students via Frog VLE, some of her students complained that they had no internet connection when they go home. Similarly, the senior assistant also highlighted the same issue with her students. Meanwhile, Dewi shared the following experience and explained how the school responded to address the issue,

> "When I first started giving students homework via the VLE, parents complained saying they don't have internet at home…we emphasised to parents that the ICT lab in the school is accessible to students until 4pm daily.There is also a computer kiosk outside the ICT lab. After that, things became better" (Dewi, 2nd July 2018).

4.5.4 Further Utilisation of Frog VLE for Teachers' Professional Practice

(a) Development of The Teachers' Learning Sites

Based on the survey in Pixel, 24 respondents (75.0%) regarded themselves as having between low to intermediate skill levels in relation to development of their own learning sites in Frog VLE. Referring to Figure 34, a total of 8 respondents (25.0%) indicated that they had no skill at all.

Figure 34: Pixel Teachers' Self-assessment on Learning Site Development Skill.

As portrayed in Figure 35, the majority of respondents (19 teachers, 59.4%) reported that at the time the survey was conducted they had developed between only 1 to 10 learning sites in Frog VLE. Five respondents (15.6%) declared that they had developed more than 10 learning sites while the remaining 8 respondents (25.0%) revealed that they had developed zero (0) learning site on the VLE platform. Thus, the result demonstrated that in Pixel, the extent of teachers' involvement in learning site development for Frog VLE was mainly at moderate level.

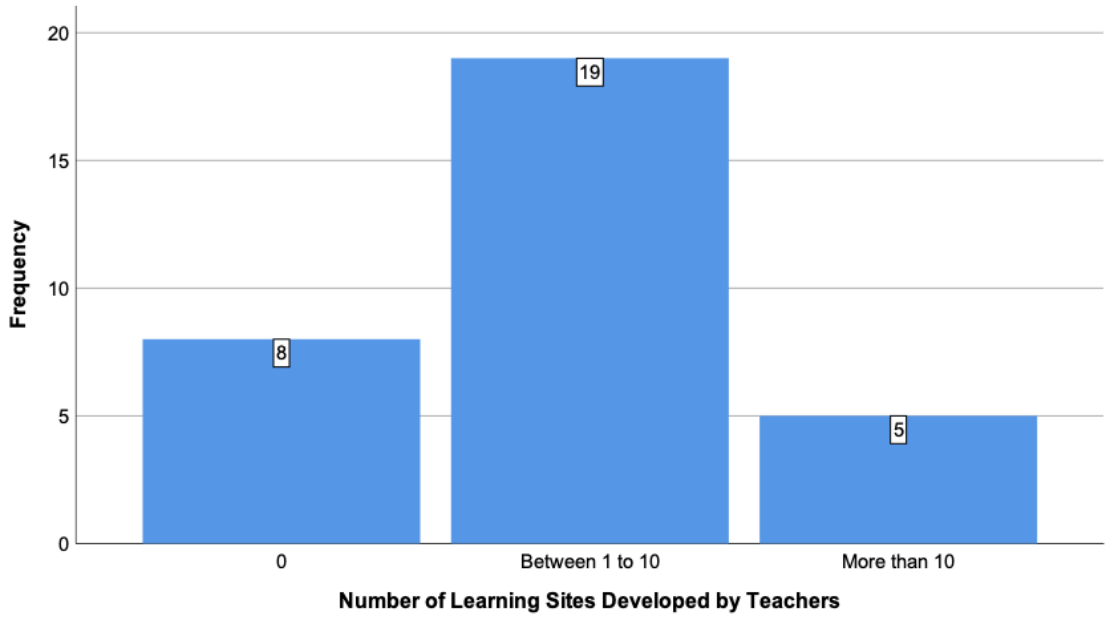


Figure 35: Learning Site Development (Pixel).

All three teachers involved in the interview sessions regularly developed their own learning sites in Frog VLE. Nonetheless, the teachers admitted that sometimes they had to postpone their learning site development because of workload and time constraints. For example, Wardina (31st May 2018) explained that teachers were always occupied with administrative duties such as organising

the school's sports event, students' examinations and progress reports. Hence, updating of the learning sites would only be done when they have free time.

Based on Table 39, the percentage for the first item was highest at 47.6%. Thus, it reflects that the respondents in Pixel mainly developed learning sites to diversify their teaching approaches. As highlighted in 4.5.3 (b), Wardina utilised the VLE platform to diversify her teaching methods to suit her students' levels. She described that students at the lower-end classes preferred audio-visual resources such as videos rather than having to read articles or only listening to her teaching in the classroom. Thus, with the VLE platform, Wardina was able to share some media and audio-visual resources for her students to view before or after the class session. On a similar note, results from the teacher survey regarding the learning site development widgets showed that the respondents in Pixel most commonly used the 'media' widget (27 respondents, 84.4%).

Table 39: Reasons for Learning Site Development (Pixel).

No.	Reasons	Frequency	Percent
1	**To diversify teaching approaches**	19	47.6
2	For own future teaching reference	7	21.9
3	To share lesson plans with other teachers	2	6.3
4	For students' independent learning	7	21.9
5	To achieve lesson objectives	2	6.3

4.5.5 School Highlights and Frog VLE Implementation Challenges

During the interview with the Senior Assistant (Academic Affairs) in Pixel, she emphasised that since the school was originally built by the state government, the size, with regard to the school's overall facilities, students' enrolment and number of teachers, was moderate and not as big as most other schools developed by the MoE. Nonetheless, being smaller in size and number gave the

school some advantages particularly regarding the relationships between the teachers and students, as well as among the teachers as colleagues. The researcher was able to observe a great rapport among the school community throughout the duration of the school visits to Pixel. The relationships were perhaps akin to a big family whereby there was a good working relationship among the teachers. Meanwhile, the teachers were easily approachable particularly to discuss matters concerning the students' academic needs.

The teachers' beliefs regarding the importance of providing access to education for the rural students in Pixel were reflected in the interviews with the three teachers and senior assistant. Although the students' lack of access to internet outside the school compound was indeed a crucial challenge to the implementation of the VLE programme, the school administrators and teachers in Pixel collaborated to overcome this particular challenge. As highlighted in 4.5.4 (c), the school's computer laboratory was accessible to the students until 4pm daily except during school holidays. The VLE coordinator had trained and appointed several 'ICT lab prefects' amongst students who stayed in the school hostel to monitor usage of the computer laboratory during weekends. Nonetheless, the students were still able to access to the ICT facilities in Pixel during school holidays by making arrangements with their teachers or the school's VLE coordinator.

Apart from the students' lack of internet access outside school compound, another challenge in Pixel was the lack of funding especially for ICT infrastructure preventive maintenance and repair costs. The senior assistant highlighted that since the school was previously owned by the state government, the computer

laboratory was not prepared according to the MoE specifications and standards to host ICT facilities. Hence, the building's wiring system was not prepared to host 30 units of computers and laptops. "We've had several occasions whereby some of the ICT equipment was damaged. We did some repairs to the wiring system and the ICT facilities, but problems still occur sometimes. When we need to do the repairs or replacements…all of that involve high cost, we don't receive a lot of money for that. There's simply no budget!" (Senior assistant, 31st May 2018).

With regard to the ICT Integration model, the senior assistant believed all four categories of teachers (Creative Adapters, Selective Adopters, Inadvertent Users and Contented Traditionalists) were present in Pixel. However, in her opinion, most of the teachers were in the category of Inadvertent Users since utilisation of Frog VLE was because of the existing circular from the MoE. As highlighted in 4.5.3 (b), there were 16 respondents (50.0%) from the teacher survey who indicated that they utilised the VLE platform to adhere to instructions from the superiors. The senior assistant added that although some teachers in Pixel were diligent and creative in utilising the VLE platform with the students, she was aware from her observations as an administrator that some other teachers in the school were lacking in terms of ICT skills. The senior assistant emphasised,

> "Some of the teachers are lacking in terms ICT competency, especially the older teachers like me (laughing). We can learn but…err… just don't want anymore! Some (teachers) feel it is unnecessary because even without VLE, they can teach…sometimes better!" (Senior assistant, 31st May 2018).

The senior assistant's opinion probably represented either the 9 respondents who believed that their Frog VLE general utilisation skill was at low level, or the 6

respondents (18.8%) who stated that they had no skill at all (see Figure 33). When commenting on the implementation challenge, the VLE coordinator also highlighted the issues regarding ICT competency as well as attitude towards change. She emphasised,

> "During every CPD session, I typically face similar problems. Apart from the internet connectivity, it's the teachers' level of understanding…different people have different pace and ability to absorb the knowledge. I personally assist them at other times whenever possible. However, there are also a few who are just reluctant to change (laughing)" (VLE coordinator, 31st May 2018).

4.5.6 Summary of Findings for Pixel

Findings from the case study in Pixel revealed that actual utilisation of Frog VLE by teachers who took part in the study was at moderate level. Most of the teachers utilised Frog VLE in teaching and learning because they wanted to provide the students with additional resources to enhance understanding of topics. Most often, the supplementary resources were in the forms of notes, exercises questions and educational games deemed attractive to the students. Results from the teacher survey suggested that most of the teachers in Pixel were in their 30s and 40s age groups. Although many of the teachers in these age groups utilised the VLE platform in teaching and learning, the integration was still associated with the traditional, teacher-focused and content-oriented approach.

The teachers who took part in the interview sessions demonstrated positive beliefs with regard to the suitability of Frog VLE integration with the education system in the country. They demonstrated good competencies with reference to the TPACK framework, thus enabling them to utilise the VLE platform efficiently support teaching and learning. Similarly, the majority of teachers in Pixel believed that their Frog VLE general utilisation skill was at intermediate level. Nonetheless,

the survey results in Pixel indicated that having knowledge and skills on how to utilise the VLE platform did not necessarily translate to actual integration in teaching and learning. Insufficient time and slow internet connectivity were among the issues hindering the teachers in Pixel from utilising the VLE platform for teaching and learning purpose.

In the meantime, the participating teachers' involvement in learning site development in Frog VLE was at low to moderate levels. Again, time constraints as a result of school workload became one of the first-order barriers that affected the teachers' involvement in learning site development. Most of the teachers developed their learning sites in Frog VLE to diversify their teaching approaches. The teachers most commonly utilised the media widget in Frog VLE to embed audio-visual resources as teaching aids to make lessons more interesting. Furthermore, inserting audio-visual materials in the learning sites was a means for some teachers in Pixel to cater for the students' academic needs especially those at the lower-end classes.

Nonetheless, one of the strengths identified from the case study in Pixel was the good rapport among the school community. Taking into consideration the rural location of the school, hence the lack of internet access at home for some of the students, the teachers and administrators in Pixel collaborated to make arrangements enabling students to access the school's computer laboratory even during school holidays. Furthermore, on some occasions, there were good working collaborations between the teachers and students with regard to creating activities using the VLE platform.

In relation to the Teachers' ICT Integration model, the senior assistant believed that all four categories of teachers were present in Pixel. Nevertheless, results from the case study in the school suggested that many of the teachers were Inadvertent Users since utilisation of Frog VLE was because of the existing circular from the MoE. Although some teachers were diligent and creative in utilising the VLE platform with the students, factors discussed earlier such as time constraints, teachers' ICT competency and attitude towards change had contributed to the teachers' utilisation of the VLE platform, particularly for teaching and learning.

PART 2: CROSS-CASE ANALYSIS

4.6 Introduction

This section presents results from the overall quantitative analysis of the teacher survey as well as findings from cross-case examinations between the five case study schools. Presentation of the results in this section follows through the same specific themes as in the previous section. This is to identify similarities and differences between the five case study schools as well as to elicit findings for discussions in the next chapter in order to address the research questions. The specific themes include teachers' actual utilisation of the VLE platform for teaching and learning, teachers' VLE utilisation factors, further utilisation of the VLE platform for teachers' professional practice as well as school highlights and implementation challenges. This section concludes with a summary of the overall findings from the cross-case analysis between the five case study schools.

4.6.1 Participants' Demographic Information

A total of 170 respondents participated in the teacher survey. Despite the perceived advantages of conducting online survey such as convenience for the

respondents and eco-friendly method, only 26 responses were gathered online. The remaining 144 respondents (84.7%) chose to answer the questionnaire using the hardcopy version. Based on Figure 36, the majority of respondents were female (142 teachers, 83.5%) and 28 (16.5%) respondents were male teachers. Statistics from the Selangor State Education Department indicated that at the time of data collection, there were 19,943 (83.0%) female teachers and 3,985 (17%) male teachers in post-primary schools in Selangor (Jabatan Pendidikan Negeri Selangor, n.d.). Hence, although the total respondents for the survey was quite low (170 teachers), the gender ratio of the respondents did reflect the wider population of post-primary national school teachers in Selangor.

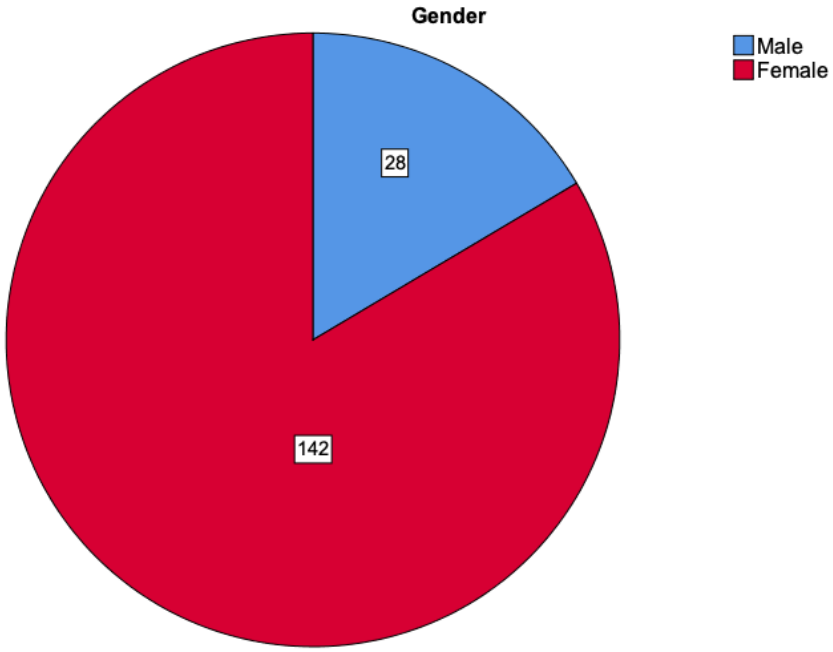


Figure 36: Overall Respondents' Gender Distribution.

The youngest respondents taking part in survey were 26 years old teachers and the oldest was a 59-year old. Figure 37 displays the gender distribution among the respondents while Figure 38 indicates a summary of the subjects taught by the respondents' in the case study schools.

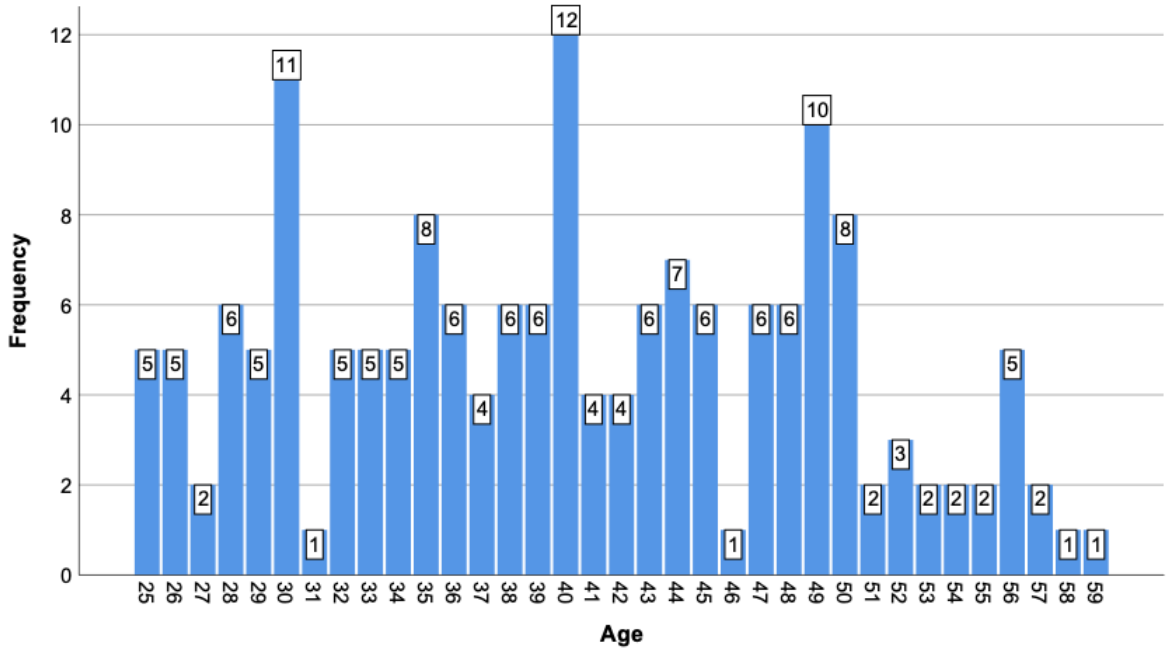


Figure 37: Overall Respondents' Age Distribution.

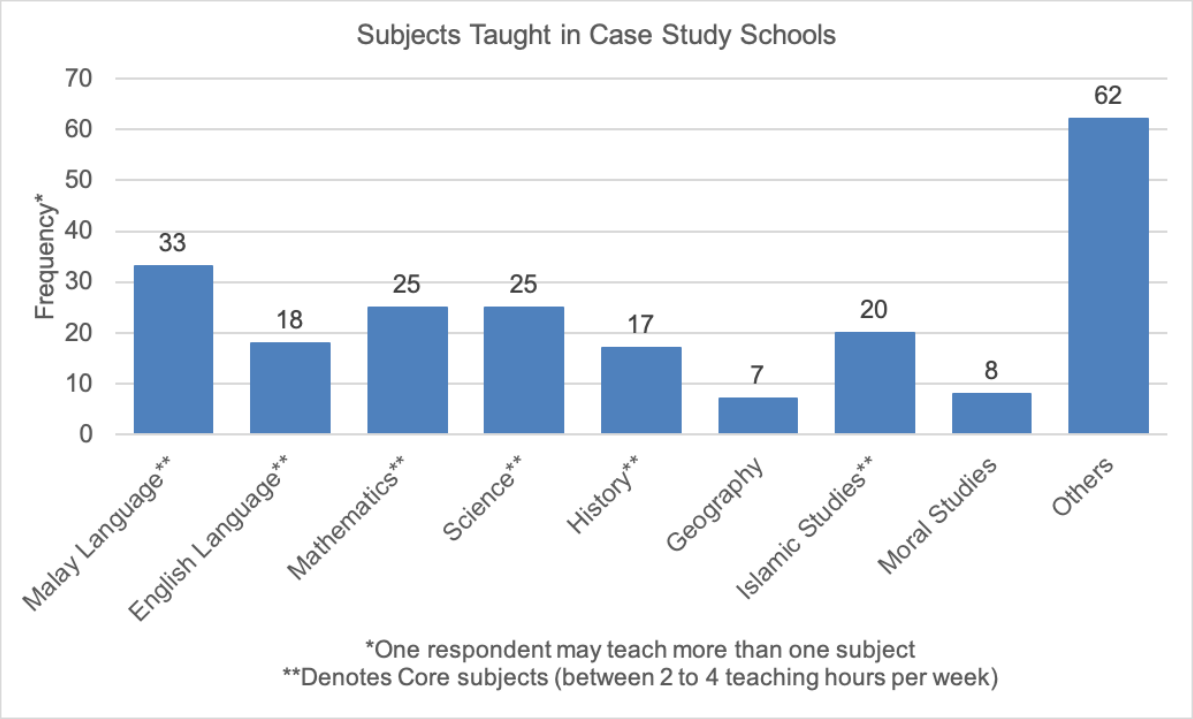


Figure 38: Subjects Taught by the Respondents in This Study.

In relation to experience with Frog VLE, the range of years varied from zero (0) or less than one year to 6 years as displayed in Table 40.

Table 40: Year (s) of Experience Utilising Frog VLE (Overall Respondents).

Number of Years	Frequency	Percent
0	1	0.6
1	33	19.4
2	43	25.3
3	49	28.8
4	22	12.9
5	20	11.8
6	2	1.2
Total	170	100.0

Meanwhile, a total of 15 teachers participated in interview sessions to gauge in-depth information whereby the majority (13 participants, 86.7%) were female teachers. Only 2 participants (13.3%) were male teachers. Based on Table 41, the teachers who were interviewed represented the 30s, 40s and 50s age groups and the majority of them were in their 40s. The participants' teaching experience spanned from 5 years to 26 years in the profession. The participants in the case study schools taught core subjects and electives such as Chemistry, Additional Mathematics and Arabic language (see Table 41).

Table 41: Overall Demographic Information Regarding Teachers Involved in Interview Sessions.

School & Pseudonym	Gender	Age group	Years of teaching experience	Subjects taught in case study schools[2]
School 1: Avatar	Male (0), Female (3)[1]	30s (2), 40s (1)	5 (2), 11	Islamic studies, Islamic and Sharia studies, Arabic language, English language.
School 2: Symfony	Male (0), Female (3)	30s (1), 40s (2)	13, 17, 20	Science, Mathematics, Chemistry, Geography, Malay language, Design Technology, Graphic, Technical and Communication.
School 3: Pascal	Male (1), Female (2)	30s (2), 40s (1)	5, 12 (2)	Mathematics, Additional Mathematics, Arabic language, Islamic studies, Islamic and Sharia studies.
School 4: Fortran	Male (0), Female (3)	30s, 40s, 50s	11, 15, 26	Additional Mathematics, Mathematics, English language.
School 5: Pixel	Male (1), Female (2)	40s (3)	14, 15, 23	Mathematics, Islamic studies, Al-Quran and Al-Sunnah studies, English language.
Total	**Male (2), Female (13)**	**30s (6), 40s (8), 50s (1)**	**5 (3), 11 (2), 12 (2), 13 (1), 14 (1), 15 (2), 17 (1), 20 (1), 23 (1), 26 (1)**	**Malay language* (1), English language* (3), Science* (1), Mathematics* (4), Islamic studies* (3), Islamic and Sharia studies (2), Al-Quran and Al-Sunnah studies (1), Arabic language (2), Chemistry (1), Geography (1), Additional Mathematics (2), Design Technology (1), Graphic, Technical and Communication (1).**

Note:
1. Figures in brackets indicate the number of participants.
2. One participant may teach more than one subject.

*denotes core subjects (between 2 to 4 teaching hours per week).

A total of 61 students were interviewed in groups regarding their experiences with Frog VLE. Table 42 displays a summary of the students' demographic information.

Table 42: Summary of The Students Involved in Interview Sessions.

Class/Level	Age	Gender	Count	Total Count
Form 1	13 years old	Boys	1	8
		Girls	7	
Form 2	14 years old	Boys	2	12
		Girls	10	
Form 3	15 years old	Boys	1	5
		Girls	4	
Form 4	16 years old	Boys	5	11
		Girls	6	
Form 5	17 years old	Boys	10	25
		Girls	15	
Total number of students				**61 students (19 boys, 42 girls)**

4.6.2 Teachers' Actual Utilisation of Frog VLE for Teaching and Learning

(a) Frequency of Integration

Analysis of the overall perspective from the quantitative data indicated that the majority of respondents (95 teachers, 55.9%) integrated Frog VLE for teaching and learning with their students approximately once a month. Figure 39 demonstrates the detailed results regarding the teachers' approximate monthly integration of the VLE platform with one class of students.

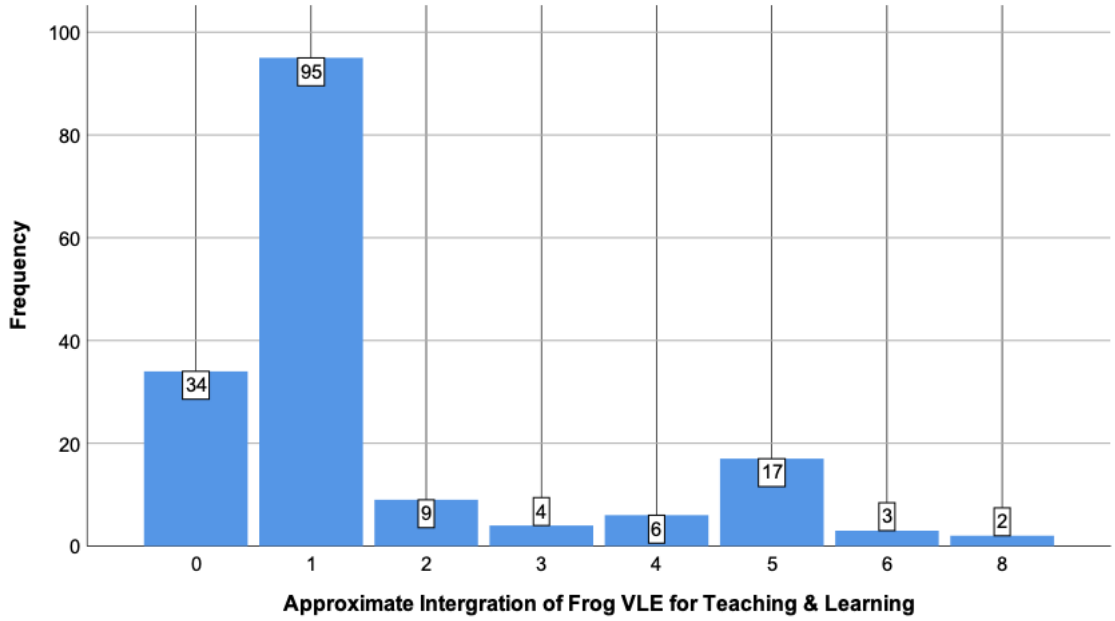


Figure 39: Approximate Integration of Frog VLE for Teaching and Learning (Overall Result).

In addition, Table 43 lists a comparison of the approximate integration of Frog VLE between the case study schools. Based on the mean values, Avatar had the highest integration of Frog VLE per month, followed by Pascal and Fortran. As fully residential schools, Avatar and Pascal had the advantage of having better ICT infrastructure compared to the other case study schools. Besides potential sponsorships from private sectors, Avatar and Pascal had budgetary advantage as a result of gaining MoE recognitions such as High Performance School (HPS) and School of Global Excellence (SGE).

Furthermore, all students in Avatar and Pascal stayed in the schools' dormitories during school terms. They also followed a structured timetable for their daily routine involving activities such as lessons during school hours, afternoon and evening revision times as well as co-curricular programmes. Thus, it was probably easier for teachers in Avatar and Pascal to incorporate the use of the

VLE platform in teaching and learning because of the good ICT infrastructure and potentially ample time for the students to do their tasks via the platform. Meanwhile, although Fortran was a regular national school, the socio-economic background of the population in the area suggested that most students also had good access to the internet when they were at home. Therefore, access to the VLE problem was not an issue for most of the students in Fortran.

Table 43: Approximate Integration of Frog VLE (per month) Between Schools.

No.	School	Mean
1	**Avatar**	**2.28**
2	Pascal	1.72
3	Fortran	1.55
4	Pixel	1.44
5	Symfony	1.05

Referring to Figure 38, many of the respondents taught core subjects such as Malay language, Mathematics and Science. With the exception of time allocation for Malay language subject (4 hours per week), the other subjects listed by respondents in Figure 38 including the electives labelled as 'Others' involved between 1 to 3.5 teaching hours per week for each class. Hence, based on the TALIS average of 17 teaching hours per week for Malaysian teachers, it was possible that a respondent who utilised Frog VLE once a month for teaching and learning was actually integrating the VLE platform between 4 to 6 times per month with all the taught classes. Therefore, the results from the multiple-case studies suggested that the actual utilisation of Frog VLE for teaching and learning as reported by the respondents was at a moderate level.

Meanwhile, the result from Spearman's Rank Order (rho) correlation test between age and actual Frog VLE utilisation yielded an r_s = -.269 and p < 0.01. The

correlation coefficient (r_s) value indicated a negative relation, to suggest that the younger the respondents' age, the higher the utilisation of Frog VLE. However, the amount of -.269 suggested only a weak correlation, depending on the result of the Sig. (p-value). Since the p-value was lower than 0.01, there was an evidence of a weak correlation between age and actual Frog VLE utilisation among the respondents. In other words, the younger the age of the respondents, the more likely there was higher integration of the VLE platform for teaching and learning, albeit the pattern was only apparent in Avatar and insignificant in the other case study schools.

(b) Utilisation of Specific Features in Frog VLE

Results from the case studies revealed that the most commonly utilised attribute offered in Frog VLE was the function to 'assign homework' to students. A total of 106 respondents (62.4%) indicated that they utilised the 'assign homework' feature according to the extent as specified in Table 44. Many of the respondents (75 teachers, 44.1%) reported that they assigned homework to their students via the VLE platform once a month. Although 55.9% of the respondents further illustrate the varying degree of utilisation of this feature, the qualitative data analysis suggested that whilst some teachers such as Maggie (case study 4: Fortran) and Wardina (case study 5: Pixel) frequently assigned homework to their students, Kareena (case study 4: Fortran) set homework to her students only during school holidays.

Table 44: Actual Utilisation of Specific Features Available in Frog VLE.

No.	Survey Item	Never		Once a month		Once a week		More than once a week	
		f	%	f	%	f	%	f	%
1	Teacher assigns homework to students.	64	37.6	75	44.1	21	12.4	10	5.9
2	Teacher utilises Frog VLE to give feedback to students about homework.	89	52.4	59	34.7	16	9.4	6	3.5
3	Teacher communicates with students' parents via Frog VLE.	150	88.2	12	7.1	6	3.5	2	1.2

Legend: f (frequency), % (percentage).

Nevertheless, results from across the five case study schools suggested that the features enabling communication to occur via Frog VLE were not highly utilised by the respondents. For example, based on Table 44, there were 150 respondents (88.2%) who never used the VLE platform to communicate with the students' parents. Similarly, more than half of the respondents (89 teachers, 52.4%) also did not give feedback to students' homework via Frog VLE. On this note, findings from the qualitative data revealed that teachers preferred face-to-face communication in the classroom to discuss or give feedback regarding homework, for convenience purposes as well as to save some time.

Table 45 presents the comparison between schools regarding the utilisation of two of the communication features available in Frog VLE. In terms of giving feedback via Frog VLE to students regarding homework, slightly more than half of the respondents in Avatar and Fortran utilised the VLE platform for that purpose. Similarly, almost half of the respondents in Pascal also used the Frog VLE feature. As highlighted in 4.6.2 (a), as fully residential schools, Avatar and

Pascal had the advantage of having better ICT infrastructure compared to the other case study schools. Therefore, students in the two schools potentially had good access to the VLE platform. Likewise, although Fortran was a regular national school, the socio-economic background of the population in the area suggested that access to the VLE platform was not an issue when the students were at home. Hence, although many teachers generally did not use the communication feature of giving feedback to students regarding homework, it was still utilised by some other teachers possibly due to the availability of good access for the students.

Table 45: Utilisation of The Communication Features – A Comparison Between The Case Study Schools.

No.	Survey Item / School	Teacher utilises Frog VLE to give feedback to students about homework		Teacher communicates with students' parents via Frog VLE	
		f	%	f	%
1	Avatar	19	59.4	5	15.6
2	Symfony	14	35.9	6	15.4
3	Pascal	12	48.0	3	12.0
4	Fortran	24	57.1	5	11.9
5	Pixel	12	37.5	1	3.1

Legend: f (frequency), % (percentage).

However, utilisation of the VLE platform for communication with the students' parents was very low in all of the case study schools, especially in Pixel (see Table 45). Findings from the individual case studies revealed that teachers and students preferred to use other social media channels for communications purposes. In addition, internet access outside the school compound was an issue in Pixel partly due to its rural location. Therefore, the problems with internet connectivity in some of the rural areas had probably aggravated the issue regarding lack of communication via Frog VLE with the students' parents in Pixel.

(c) Application of Frog VLE for Teaching and Learning in the Five Case-Study Schools

The results from the cross-tabulation analysis between gender, age groups and main purpose for Frog VLE utilisation in teaching and learning revealed that in general, the respondents integrated the VLE platform to provide their students with additional resources in order to enhance understanding of topics (see Table 46). Although the second highest total number was for 'Not Applicable', it suggested that the respondents either only integrated the VLE platform for reasons other than teaching and learning or never utilised the platform at all. The next common reason for the integration of the VLE platform in teaching and learning was to provide supplementary materials as well as to test students' understanding of topics (refer items (ii) in Table 46).

Hence, with reference to the four categories of VLE use as elaborated by Lameras et. al. (2012), results from multiple-case studies revealed that the majority of the respondents who were in their 30s and 40s were more inclined to integrate the VLE platform in the traditional, teacher-focused and content-oriented approach. As portrayed by the results from the Spearman's Rank Order (rho) correlation test between age and actual Frog VLE utilisation described earlier in 4.6.2 (a), the younger the age, the more likely there was higher integration of Frog VLE for teaching and learning. Nonetheless, the nature of integration that was more traditional, teacher-focused and content-oriented had deviated from the MoE's aspiration of promoting 21st century learning environment and skills to the students.

Table 46: Cross-tabulation Analysis Between Overall Gender, Age Groups and The Main Purpose for Integration of Frog VLE in Teaching and Learning.

Age groups	Gender	Not applicable	(i) To provide additional resources	(ii) To provide additional resources and test students' understanding	(iii) To allow students to further explore topics and express opinions (discussions & debates)	(iv) To allow students for further exploration of topics, collaborate in groups and present new discoveries	Total
20s	Male	0	1	0	1	2	4
	Female	5	7	2	3	2	19
30s	Male	0	2	2	1	0	5
	Female	11	21	11	4	5	52
40s	Male	5	3	5	1	1	15
	Female	14	14	10	7	3	48
50s	Male	2	1	1	0	0	4
	Female	7	8	6	2	0	23
Total		44	**57**	37	19	13	170

4.6.3 Teachers' Frog VLE Utilisation Factors

(a) Suitability for The Education System

Findings from the individual case studies suggested that that one of the factors influencing the utilisation and integration of Frog VLE in teaching and learning was due to its relevance in supporting the education system, particularly the curriculum, subject syllabus and students' assessments. There was evidence in every case study school of how the teachers utilised the VLE platform to suit the topics or subjects they were teaching, as well as to prepare their students for examinations.

Table 47 presents excerpts from some of the teachers' interviews to portray examples of how the participants utilised Frog VLE to suit the subject syllabi and students' assessments. The examples in Table 47 represents answers from teachers who were teaching different subjects. Hence, this suggests that utilisation of the VLE platform is applicable across curricula and subjects, provided the teachers know when and how to apply the technology for teaching and learning.

Table 47: Extracts from Teacher Interviews Regarding Suitability of Frog VLE to Support Education System.

No.	School	Subject	Extracts from Teacher Interviews
1	Avatar	Arabic Language	"We do student assessments twice a year…using the VLE makes it easier to have evidences or indicators for student assessments. We can see their progress from the first quiz, to the second and et cetera" (Amira, 3rd May 2018).
2	Symfony	Graphic, Technical and Communication (GKT)	"The Form 4 GKT textbook is not for regular loan for the students…So, I uploaded relevant notes via Frog VLE. Students utilise Frog VLE to do their revision…Part B…involves practical work…there are PowerPoint or slides in Frog VLE that provide step-by-step guidance for students' preparation for the practical work" (Bella, 27th June 2018).
3	Pascal	Islamic Studies	"Now (July) I concentrate more on students sitting for the main examination. Students can get a lot of information, especially nowadays many questions relate to HOTS (higher-order thinking skills). So, it is very important they look for information and explore (Frog VLE)" (Nazim, 18th July 2018).
4	Fortran	Additional Mathematics	"It's like the flipped classroom approach. I tell my students to watch a video or read an article when they're at home…in class, we discuss…for instance the application of the theory in real life, its usage. My students show more interest in the topic if they understand how to apply in real life, rather than just knowing the theory" (Maggie, 23rd April 2018).
5	Pixel	Mathematics	"…if we do an activity with Kahoot! there is a set time for students…the students can write their solutions in their exercise books…only this time they record their answers on the computer in front of them. I usually discuss the work solutions with my students after the Kahoot! session. So, students use the opportunity to check their understanding of the topic and also practise answering the questions within a specified time, just like during examinations" (Ismail, 31st May 2018).

(b) Teacher-related Factors

Apart from the VLE platform's relevance in supporting the education system, findings from the multiple-case studies indicated that teacher-related factors also contributed to the extent of the VLE utilisation. The Interconnected Model of Teacher Professional Growth by Clarke and Hollingsworth (2002) suggests four domains that influence the teachers' change environment. The four areas are personal domain, external domain, domain of practice and domain of consequence. There were evidences from the individual case studies that portrayed how the four domains interacted with each other to influence the teachers' decisions whether or not to utilise the VLE platform. For example, findings from the quantitative and qualitative data analyses revealed that adherence to instructions from the superiors (external domain) together with the teachers' attitude and beliefs regarding education (personal domain) were among key factors that led the teachers to experiment with change (domain of practice). As a result of the experimentation, the teachers either experienced or observed salient outcomes that further strengthen their decisions whether or not to utilise the VLE platform for their professional practice.

To illustrate further, the MoE had issued a circular encouraging teachers to utilise the VLE platform provided to schools. In addition, there was also a set of VLE-related KPIs that schools were expected to achieve every year. Although there were instructions and KPIs, the decision of whether or not to utilise the VLE platform also depended on the teachers' beliefs and attitude. Based on the qualitative data analyses, the school administrators and VLE coordinators from Avatar, Symfony, Fortran and Pixel believed that Contented Traditionalists (teachers who did not want to embrace or practise change) still existed in their

schools, albeit possibly only a minority group. The school administrator in Pascal believed that there was no Contented Traditionalist in the school, because all teachers used the platform whether for academic, co-curricular or management duties.

Based on the individual data analysis, three teachers in Pascal indicated zero utilisation of Frog VLE for teaching and learning. Taking into consideration input from the school administrator regarding utilisation of Frog VLE for management duties, the researcher scrutinised the three teachers' responses in relation to Statements 21 to 24 in Section 4 of the survey, which were constructed based on the Teacher ICT Integration model. The analysis revealed that two of the teachers recorded low responses (Likert Scales 1 or 2: Strongly Disagree or Disagree) with regard to the statements (see Table 48).

Table 48: Case study 3: Pascal ~ Extract of The Teachers' Responses That Indicated Potential CTs.

Respondents' Code	Q21. Utilise Frog VLE to improve students' academic grades	Q22. Utilise Frog VLE to diversify pedagogy	Q23. Utilise Frog VLE because of others (i.e. peer pressure)	Q24. Utilise Frog VLE because of adherence to instructions	Approximate number of integration (per month)
CS3_R19	2	1	2	3	0
CS3_R23	1	2	2	3	0

The two teachers recorded similar responses for items that gauged their beliefs regarding the integration of the VLE for teaching and learning (see Table 49). The responses suggested that those teacher respondents did not perceive utilisation of the VLE platform as beneficial for their students, hence the zero integration in

teaching and learning. Thus, such teacher belief and behaviour suggest that the teachers are potentially in the category of CT.

Table 49: Case study 3: Pascal ~ Extract of The Teachers' Responses for Items Q53 to Q54.

Respondents' Code	Q53. VLE can support the curriculum	Q54. VLE is useful to support students' examinations	Q55. VLE is useful for students' future.
CS3_R19	3	1	2
CS3_R23	2	2	2

In the overall multiple-case study, there were 13 potential CTs (7.6%) among the respondents who recorded similar answer patterns as those portrayed on Table 48 and Table 49. Whilst it was easier to identify a potential CT, identification of the other three categories of teachers was complex. Results from this study indicated that the majority of the teachers were in the category of IU, because 96 respondents (56.5%) indicated that the reason for them utilising Frog VLE was to adhere to instructions from their superiors.

Nevertheless, referring to the examples from some of the teacher responses as demonstrated on Table 50, the respondents who recorded high responses (Likert Scale 4 or 5: Agree or Strongly Agree) for adherence to instructions also marked similar high responses to statements that suggested emphasis on students' academic grades or examinations. Likewise, the respondents who recorded 4 and 5 times of VLE integration per month demonstrated high Likert Scale responses for the statement regarding utilisation of the VLE to diverse their pedagogical approaches (characteristics of a potential CA). However, the same respondents also placed similarly high responses regarding the students'

academic grades. Therefore, in this context, it is difficult to categorise the teachers to only one specific category, either a CA or a SA. Nevertheless, this finding triangulates with the results in this study that indicated the teachers' emphasis on students' assessments and examinations, particularly in case study schools Avatar, Pascal and Fortran.

Table 50: Extract from the Overall Teachers' Responses to Q21 to Q24.

Respondents' Code	Q21. Utilise Frog VLE to improve students' academic grades	Q22. Utilise Frog VLE to diversify pedagogy	Q23. Utilise Frog VLE because of others (i.e. peer pressure)	Q24. Utilise Frog VLE because of adherence to instructions	Approximate number of integration (per month)
A_R31/1	4	4	4	5	1
A_R46/2	4	3	2	4	1
A_R77/3	4	4	4	4	2
A_R116/3	5	5	1	2	4
A_R137/4	5	5	1	1	5

While some teachers such as Lily (case study 3: Pascal) and Kareena (case study 4: Fortran) continued to utilise Frog VLE because of the circular and instructions, others such as Wardina (case study 5: Pixel), Kathy (case study 2: Symfony) and Rosalind (case study 3: Fortran) became more comfortable utilising the VLE platform particularly after experiencing some of the perceived benefits for teachers such as the ability to provide cloud storage for repository and easy retrieval of their teaching and learning materials.

Analysis from the study has identified two types of teachers within the IU category. Donnelly et al. (2011:1479) suggested that IUs would utilise the technology “but with hesitation”. This study revealed that there were teachers such as Lily (case study 3: Pascal) and Kareena (case study 4: Fortran) who fit the description of IU as proposed by Donnelly et al (2011), hereafter referenced as IU Type 1. However, for teachers such as Saleha (case study 1: Avatar), Kathy (case study 2: Symfony), Rosalind (case study 4: Fortran) and Wardina (case study 5: Pixel), the utilisation became voluntary after they experienced some of the perceived benefits from the VLE integration.

Nonetheless, these teachers who represented the IU Type 2 highlighted that adherence to instruction and the responsibility to help the school fulfil the VLE-related KPIs were still among the important factors influencing their decision to utilise the platform in teaching and learning. The Interconnected Model of Teacher Professional Growth and the TPACK framework explicitly suggested that teachers’ change is partly influenced by their environment and context, including the culture surrounding the school and community. Findings from this study suggest that the IU Type 2 is a result of enculturation of the societal culture, which will be discussed further in the next chapter.

Meanwhile, apart from observing or self-experiencing salient outcomes from the integration of the VLE platform, another factor that influenced the utilisation was related to the teachers’ ICT skills. As portrayed in Figure 40, the majority of respondents (148 teachers, 87.1%) regarded their Frog VLE general utilisation skill as between low to intermediate levels. Based on the TPACK framework by Koehler, Mishra and Cain (2013), it is important for teachers to have appropriate

technological knowledge to know when and how to integrate ICT to support the pedagogy and content delivery.

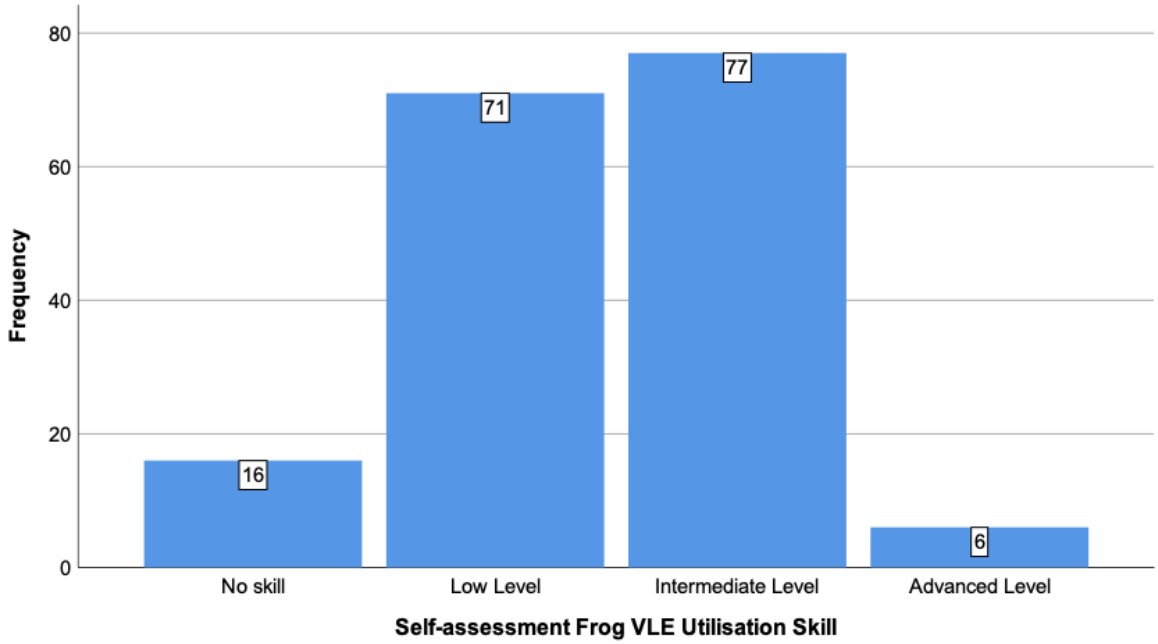


Figure 40: Overall Teachers' Self-assessment on Frog VLE General Utilisation Skill.

Referring to Figure 40, a total of 16 respondents (9.4%) indicated that they had no skill at all regarding how to utilise Frog VLE. This was in contrast with 34 respondents (20.0%) who indicated that they had zero integration of Frog VLE for teaching and learning (see Figure 39). There are two possible explanations to associate with the difference in the numbers. Firstly, the respondents had zero integration of Frog VLE specifically for teaching and learning purposes but did utilise it for other reasons such as submission of lesson plans and report writing. Secondly, the respondents did not integrate Frog VLE for teaching and learning due to other factors such as time constraint (external domain). Based on the teacher survey, there were more respondents who highlighted that they experienced time constraints associated with Frog VLE integration, compared to

respondents who felt that time was not an issue for them. Further discussions regarding time will be elaborated in 4.6.5.

(c) Student-related Factors

Results from the individual case studies suggested that some student-related factors also affected the teachers' utilisation of the VLE platform for teaching and learning. In every case study school, there were teacher participants who expressed that they became more motivated to integrate Frog VLE in teaching and learning after observing favourable responses from their students. For example, Sheila (from Avatar), Dewi (from Pixel) and Nazim (from Pascal) highlighted that they had observed their students becoming more focused in completing tasks involving Frog VLE integration. In Avatar, Symfony, Pascal and Pixel, the students were described as feeling excited particularly when the VLE integration involved gamifications. Based on the qualitative data analyses involving interviews with the teachers and students in those schools, the most popular educational game utilised in Frog VLE was Kahoot! Both the teachers and students emphasised that gamifications such as Kahoot! and Quizziz provided an opportunity for the students to do revision of subjects in a fun environment.

Apart from observing favourable responses from students, results from the qualitative data analyses also revealed that another motivation for the teacher participants to integrate the VLE platform in teaching and learning was because of the VLE's potential benefits for students. Among others, Roslina (from

Symfony) elaborated that with the VLE platform, it was easier for the students to do group collaborations outside the official school hours. Since all materials were shared via Frog VLE and could be edited by every group member, discussions became more flexible and were not restricted to face-to-face interactions only. Roslina and her students commented on the cloud storage and convenience of sharing materials with each other via the VLE platform. Group presentation materials were accessible for the teacher and all students in the class at any time. In addition, the cloud storage and availability of online resources helped to reduce paper consumption, physical storage as well as enabled students to do assignments or revisions according to their own time and pace.

4.6.4 Further Utilisation of Frog VLE for Teachers' Professional Practice

(a) Development of The Teachers' Learning Sites

Based on the overall teacher survey, 142 respondents (83.5%) regarded themselves as having between low to intermediate skill levels in relation to development of their own learning sites in Frog VLE. A total of 28 respondents (16.5%) indicated that they had no skill at all (see Figure 41).

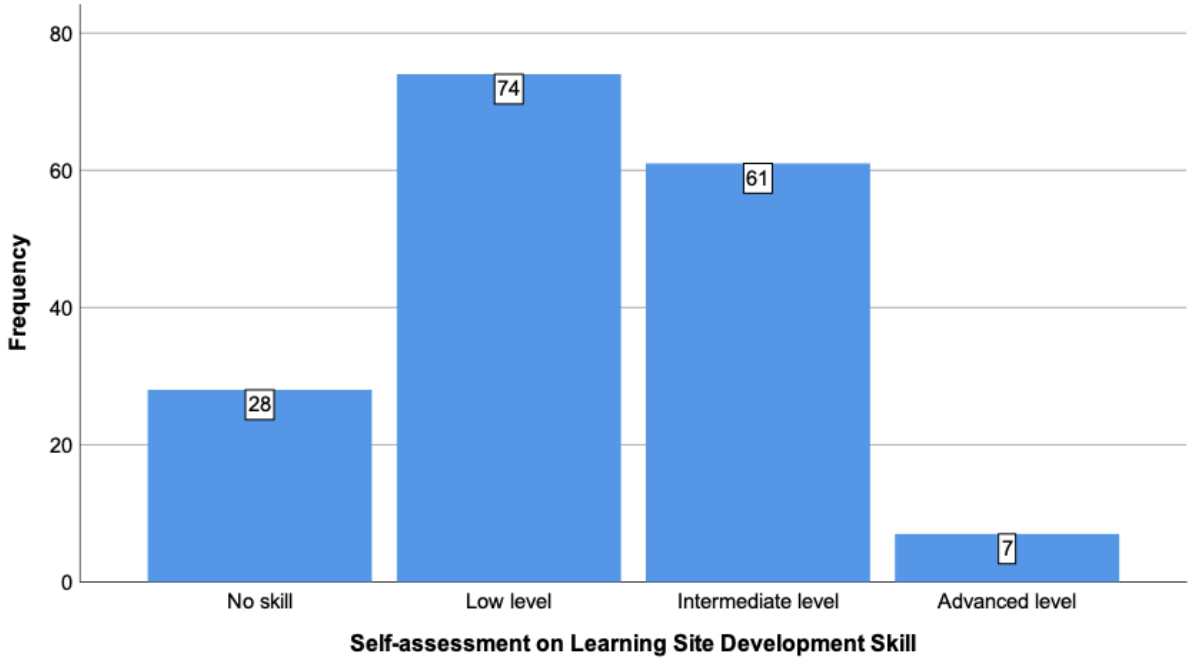


Figure 41: Overall Teachers' Self-assessment on Learning Site Development Skill.

Meanwhile, Figure 42 displays the comparison of results between the case study schools in relation to the respondents' self-assessment of Learning Site development skill levels. Based on the graph, most of the respondents in Avatar, Pascal and Pixel believed that their learning site development skills were at an intermediate level. On the other hand, most of the participants in Symfony and Fortran regarded themselves as having low level skills to develop learning sites in Frog VLE.

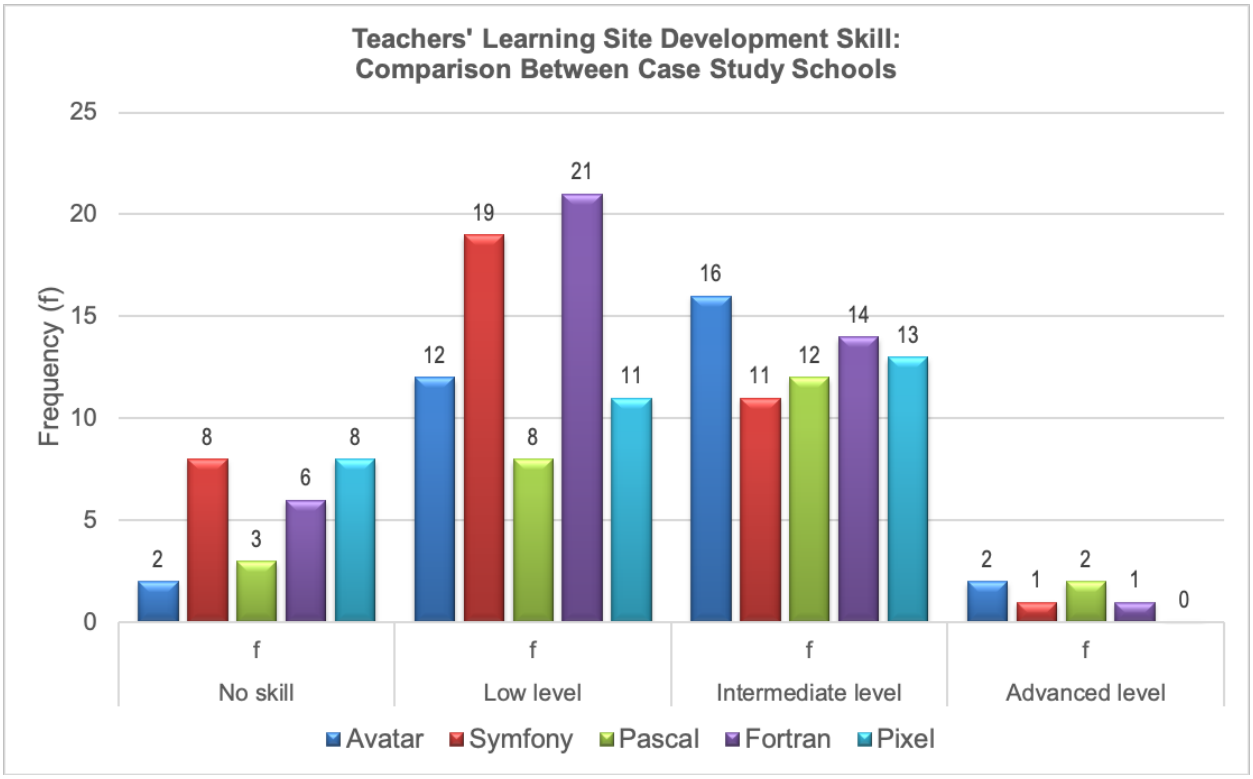


Figure 42: Comparison Between Teachers' Self-assessment on Learning Site Development Skill.

In general, the majority of respondents (107 teachers, 62.9%) had developed between only 1 to 10 learning sites in Frog VLE. There were 18 respondents (10.6%) who declared that they had developed more than 10 learning sites while the remaining 45 respondents (26.5%) indicated that they had developed zero (0) learning sites at the time the survey was conducted (see Figure 43). Thus, the result demonstrates that overall the extent of teachers' involvement in learning site development for Frog VLE was at a moderate level.

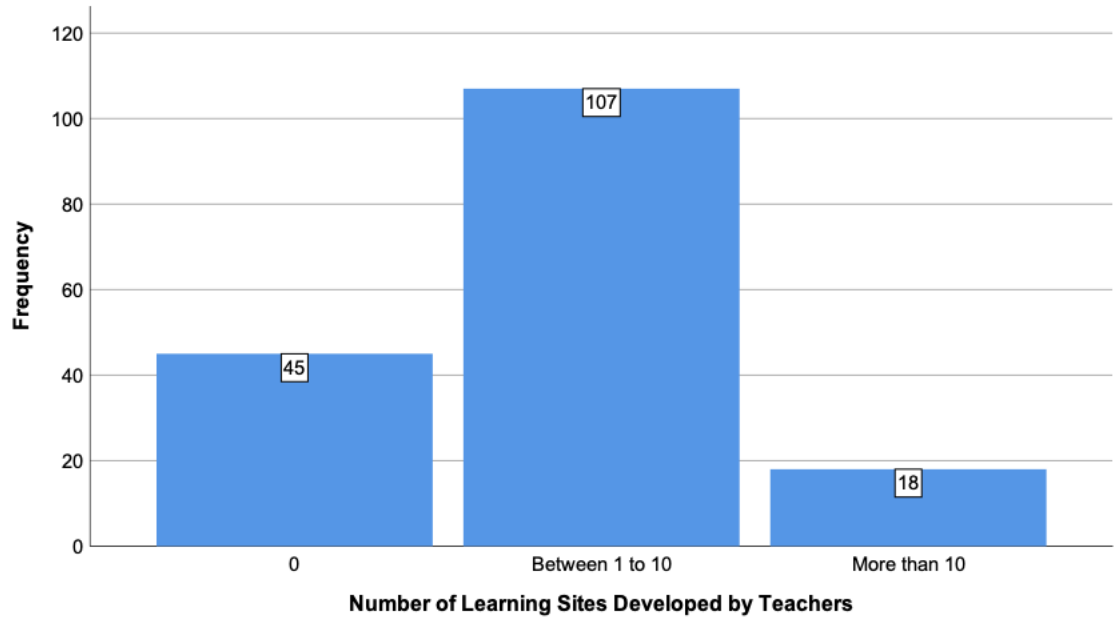


Figure 43: Overall Learning Site Development.

A comparison between schools in relation to the number of learning sites that had been developed by the teachers revealed that in every case study schools, the majority of respondents had developed between 1 to 10 learning sites (see Figure 43). Based on Table 51, the top three case study schools with the highest total number of learning sites were Symfony, Pascal and Pixel. Referring back to Figure 42, most of the respondents in Pascal and Pixel had intermediate learning site development skills hence potentially contributed to the greater number of learning sites that had been developed compared to other schools.

However, in the case of Symfony, although it appeared to be the school with the second highest number of learning sites developed (see Table 51), most of the respondents self-assessed their skill as at a low level (see Figure 42). In addition, there were 8 respondents (20.5%) in Symfony who had no skill at all. Examining the results from the individual case study, the scenario in Symfony occurred possibly as a result of the implementation of Frog Champions in the school who

offered one-to-one assistance to teachers in utilising features in Frog VLE. In addition, the CPD sessions in Symfony focused on coaching the teachers in small groups based on their Frog VLE competencies. Hence, despite the lower result regarding self-assessment on learning site development skills, the data presented here suggests that the personalised coaching and assistance led to the teachers experimenting or developing more learning sites as part of their CPD activities.

Table 51: School Comparison Related to the Number of Learning Site Development.

No.	School / Skill Level	0		Between 1 to 10		More than 10		Total Learning Site Developed	
		f	%	f	%	f	%	f	%
1	Avatar	9	28.1	20	62.5	3	9.4	23	71.9
2	Symfony	9	23.1	26	66.7	4	10.2	**30**	**76.9**
3	Pascal	6	24.0	16	64.0	3	12.0	**19**	**76.0**
4	Fortran	13	31.0	26	61.9	3	7.1	29	69.0
5	Pixel	8	25.0	19	59.4	5	15.6	**24**	**75.0**

Legend: f (frequency), % (percentage).

In terms of the reasons for learning site development, Table 52 suggests that the common reasons recorded by the respondents were firstly to diversify their teaching approaches, secondly for the students' independent learning and thirdly as a repository for educational resources for the teachers' professional practice (future teaching reference). The results portrayed in Table 52 also triangulates with the findings discussed in 4.6.3 regarding the teachers' general Frog VLE utilisation factors. The teacher participants believed that integration of Frog VLE is suitable for teaching and learning. Therefore, it is possibly easier for the teachers to develop their own learning sites because they believed utilisation of

the VLE platform can support teaching and learning. Integration of the VLE platform in teaching and learning hence enabled these teachers to diversify their pedagogy. Similarly, the student-related factors as discussed in 4.6.3 were crucial in influencing the teachers to incorporate Frog VLE in teaching and learning. Finally, there were also highlights regarding some of the VLE platform's benefits for the teachers particularly associated with cloud storage and repository for the teachers' teaching and learning materials. The repository attribute hence enabled a more efficient retrieval of online teaching resources for the teachers' professional tasks.

Table 52: Reasons for Learning Site Development (Overall Respondents).

No.	Reasons	Frequency	Percent
1	**To diversify teaching approaches**	**84**	**49.4**
2	**For own future teaching reference**	**57**	**33.5**
3	To share lesson plans with other teachers	31	18.2
4	**For students' independent learning**	**58**	**34.1**
5	To achieve lesson objectives	46	27.1

Nonetheless, results from the quantitative data analysis revealed that only 49 respondents (28.8%) believed their VLE integration in teaching and learning became higher after they have developed their own learning sites. Most of the respondents (65 teachers, 38.2%) chose to be neutral in their answer while 56 respondents (32.9%) indicated that developing their own learning sites did not lead them to increase their Frog VLE integration. Among the potential factors contributing to the results were due to the existence of Key Performance Indicators (KPIs) as well as the quality of materials on the teachers' learning sites. Further discussions regarding the two factors are included in the following section.

4.6.5 School Highlights and Frog VLE Implementation Challenges

Findings from the multiple-case studies revealed that besides integrating Frog VLE for teaching and learning as well as the development of the teachers' learning sites, the platform was also commonly utilised for other purposes such as management of the students' co-curricular programmes, submission of the teachers' lesson plans to the school administrators and sharing of reports as well as other materials related to school activities.

Table 53 in the next section presents an overview of the whole case study schools including a summary of each school's highlights and Frog VLE implementation challenges. As discussed earlier in 4.6.2 (a) and (b), Avatar and Pascal had the advantage of having good ICT infrastructure due to their status as fully residential schools that had received specific recognition from the MoE. Therefore, access to the internet and VLE platform was not a crucial issue for students and teachers in the schools. Nonetheless, the availability of alternative VLE platforms were regarded as a challenge to the implementation of the platform officially provided by the MoE. On this note, the researcher had the opportunity to interview a policymaker in the MoE's Educational Technology Division (now known as Educational Resource and Technology Division). The policymaker, who was the Head of the eLearning Resources subdivision highlighted that the issue of alternative VLE platforms had been discussed during the MoE's higher-level management meetings. The MoE had issued a letter to schools encouraging teachers to use Frog VLE, as it was the learning platform provided by the ministry. There was no policy or instruction restricting teachers from using other VLE platforms.

Nonetheless, the policymaker admitted that there were two VLE-related KPIs set by the MoE, namely associated with the monthly average number of students utilising the VLE for learning, and the percentage of teachers sharing their learning sites in the VLE's repository. Hence, although teachers had the freedom to choose any VLE platform that they felt comfortable to use, the KPIs was probably a subtle approach by the MoE to ensure that the teachers and students still utilise Frog VLE. However, as highlighted in 4.6.4, most of the teacher respondents in the case study schools suggested that their integration of the VLE platform for teaching and learning did not necessarily increase despite having developed their own learning sites. It is possible that the teachers accessed Frog VLE to develop the learning sites, hence providing educational resources for the students' reference and simultaneously helping their schools to achieve the KPI related to learning site development.

Nonetheless, findings from the case study in Avatar suggested that the quality of materials published on the teachers' learning sites were questionable. Similarly, based on results from the overall teacher survey, only 62 respondents (36.4%) indicated that there were quality resources in Frog VLE. Thus, it potentially became another factor that hindered some teachers from optimising materials from the learning sites to be utilised as their teaching aids. Indeed, the quality of an educational material can be a subjective evaluation. However, in response to the quality of resources on the learning sites submitted by teachers to the MoE repository, the policymaker informed that the materials were firstly received by a team of evaluators in the Educational Resource and Technology Division. The team evaluated and ensured that each resource fulfilled a set of criteria before being published and made accessible to all Frog VLE users. Materials that did

not meet the criteria were returned to the teachers with comments for improvements. Hence, although the quality of some materials might be questionable, they had fulfilled at least a certain level of requirements set by the MoE.

One common challenge identified via the multiple-case studies was related to time constraints. The participants faced time constraints firstly when preparing their teaching and learning materials to be uploaded on the learning sites. Time constraints at the preparation stage were mainly attributed to the workload associated with the teachers' professional practice. Nonetheless, some participants did not view this first-order barrier as a total hindrance for them to prepare the teaching and learning content for Frog VLE. In contrast, they highlighted that they would find other suitable time to develop the content for their learning sites.

Secondly, results from the multiple-case studies also revealed that some participants expressed that there was insufficient time for them to integrate Frog VLE during classroom teaching and learning sessions. In Malaysia, one period of lesson is equivalent to 30 minutes. Most often, lessons with the VLE integration had to be conducted in the ICT laboratory as most of the classrooms were not equipped with technology. Hence, time was already spent when the students' proceeded from the classroom to the ICT laboratory, and subsequently while the students prepared themselves for the lesson such as switching on the computers and logging in to their VLE accounts. As a result, many of the participants preferred to incorporate the use of the VLE platform for the students' homework or assignments.

4.6.6 Summary of Findings

This section presents the summary for this chapter and the key findings are categorised according to sub-sections namely the Extent of Frog VLE Integration, Significant Factors Leading to Integration of The VLE Platform for Teaching and Learning, Teachers' Participations in Learning Site Developments, Impact on Teacher-Student Relationship and Implementation Challenges.

(a) Extent of Frog VLE Integration

Findings from the multiple-case studies indicated that the actual utilisation of Frog VLE by the participants in the study was at moderate level. Most of the participants utilised Frog VLE in teaching and learning because they wanted to provide the students with additional resources to enhance understanding of topics. The supplementary resources which was usually assigned via the VLE platform as homework, were mostly in the forms of relevant notes, videos and exercise questions. In addition, many participants incorporated educational games available on the VLE platform as part of teaching and learning because of the favourable responses shown by the students. To the students, playing the educational games was an enjoyable approach for revision. They were able to study and enjoy themselves at the same time. Nonetheless, utilising the VLE platform for the purpose of providing additional resources meant that the VLE integration was still associated with the traditional, teacher-focused and content-oriented approach. This approach which was akin to the exam-oriented education was among the VLE implementation challenges highlighted in Symfony, Pascal and Fortran.

(b) Significant Factors Leading to Integration of The VLE Platform for Teaching and Learning

Findings from the multiple-case studies suggested that among the factors influencing the teachers' VLE utilisation were associated with the suitability of the learning platform with the education system, particularly in supporting the components of the different subject curricula, as well as the students' examinations and assessments. Furthermore, the teachers were also inclined to utilise the VLE platform due to the perceived advantages for them as well as for the students. Results from the qualitative data analyses of the individual case studies provided examples of how the teacher participants integrated the VLE platform in teaching and learning to suit the different curriculum and subjects. At the same time, the examples demonstrated that these teacher participants were able to practise their knowledge and skills based on the TPACK framework.

More than half of the teachers involved in this multiple-case studies indicated that they utilised Frog VLE to adhere to instructions from the superiors, particularly at the beginning stage of the implementation. However, the qualitative data analyses demonstrated some evidences of teachers who continued to utilise the learning platform due to the perceived advantages for teachers. In addition, the majority of teachers involved in the case studies regarded themselves as having between low to intermediate levels of general Frog VLE utilisation skill.

Analyses from the case studies also portrayed some examples of the potential benefits from the VLE integration for the students. There were

evidences of teachers who became aware of the students' more active engagements during lessons with the VLE integration. The students highlighted that they enjoyed learning and doing revisions via the VLE platform particularly each time involving gamifications. Apart from that, integration of the VLE platform added convenience for the students to do group assignments because editing of documents could be carried out simultaneously online, while group presentation materials could be stored and shared virtually for future reference and revisions.

(c) Teachers' Participations in Learning Site Developments

In general, the teachers' involvement in learning site development for Frog VLE was between low to moderate level. Results from the cross-case analysis suggested that in schools where the majority of teachers self-assessed themselves as having intermediate skills with regard to learning site development, the total number of learning sites that had been developed was higher compared with the other schools involved in this study. Specific programmes conducted in schools such as the Frog Champion initiative and CPDs based on the teachers' VLE competencies also contributed to the higher total number of learning sites developed. However, the analysis also revealed that having developed more learning sites did not guarantee higher integration of the VLE platform in teaching and learning. Apart from developing the learning sites because there was a need to achieve the KPI, again time constraints related to workload were considered as a barrier that continued to impede the teachers, not only from actively participating in learning site development but also from utilising the VLE platform for teaching purposes.

(d) Impact on Teacher-Student Relationship

There were evidence in the study that suggested integration of the VLE platform in teaching and learning had resulted in increased communication between the teachers and their students. Teachers and students from Symfony, Pascal, Fortran and Pixel highlighted that since utilising Frog VLE, there were better opportunities for the students to ask questions to their teachers regarding homework and lesson topics. The ubiquitous nature of the VLE integration enabled students to access a vast array of educational resources prior or post a particular lesson. Thus, via a flipped classroom concept, the students had more opportunities to prepare questions associated with articles or tasks assigned to them prior to the actual lesson.

On the other hand, supplementary educational materials posted on the VLE platform after particular lessons allowed the students to do revisions and reflections regarding the topics they had learnt. Questions that arose from their readings and revisions led to potential interactions with their teachers. In the traditional teaching and learning approach, there were limitations in terms of teacher-student interaction time and method. Nonetheless, the students in Symfony and Pascal emphasised that with Frog VLE, they gained more confidence to seek further clarifications from their teachers regarding homework or revision materials because there was always the option of asking questions via the VLE platform or during face-to-face classroom interactions. Observations in this study indicated that during lessons with Frog VLE that adopted 21st century teaching and learning pedagogy, it was easier for the teachers to perform their role as facilitators whilst there were

active discussions among the students as well as regular interactions and collaborations between the teachers and students.

(e) Implementation Challenges

Results from the multiple-case studies have identified several implementation challenges from both categories of first-order and second-order barriers. Time constraints was a challenge highlighted in each case study school. It became a hindrance to the teachers' active participation in developing educational resources for their learning sites and incorporating the use of the VLE platform in teaching and learning. Furthermore, although the findings indicated that the majority of the teacher participants had between low to intermediate skill levels in terms of Frog VLE integration and learning site development, time constraints due to other professional workload also refrained the teachers from attending relevant CPD sessions.

Problems with regard to ICT infrastructure such as slow internet connectivity and inadequate number of computers were also present in this study. However, this first-order barrier was not observed in the fully residential schools namely Avatar and Pascal. Other first-order barriers identified from the multiple-case studies included the perceived lack of user-friendliness of Frog VLE, issues regarding the quality of educational resources produced by the teachers, the pressure to achieve the VLE-related KPIs and the existence of some alternative VLE platforms.

Meanwhile, findings from this study suggest that issues regarding teachers' beliefs contributed to the second-order barrier challenging the

implementation of Frog VLE in the case study schools. The teachers and school administrators particularly in Symfony, Pascal and Fortran regarded the students' examination results as highly crucial to meet the expectations from the students' parents as well as to maintain the schools' good academic reputations. This occurred despite the MoE's efforts to tailor more formative rather than summative students' assessments as well as providing ICT infrastructure to support and encourage the adoption of 21st century teaching and learning pedagogy. The exam-oriented teachers' belief led to the utilisation of Frog VLE mainly akin to the traditional, teacher-focused and content-oriented approach. Subsequently, findings from the study suggest that based on the Teacher ICT Integration model, there were many teachers in the categories of Selective Adopters (SA) and Inadvertent Users (IU). The SAs were apparent in Symfony, Pascal and Fortran because of the schools' emphasis on examination and students' academic results whilst the IUs were evident across all schools due to the nature of utilising Frog VLE to adhere to instructions from the higher authorities.

Table 53: Overview of The Case Study Schools.

School	School Background	Extent of VLE Utilisation for Teaching & Learning	VLE Learning Site Development	Teacher ICT Integration Model (potential number of teachers) T2: IU Type 2	School Infrastructure & Support Metrics	VLE Utilisation Challenges
Avatar	• Fully residential / boarding religious (Islamic) school. • Sub-urban location. • High-performance School recognition.	Moderate.	Moderate	IU (19 + 2 T2) CA (6) CT (3) SA (2)	i. Good ICT infrastructure (adequate equipment, students' personal iPads). ii. Assistance from younger teachers in every department to support colleagues.	i. Time constraint (to prepare and implement). ii. Questionable quality of materials on learning sites. iii. Perceived less user-friendly VLE features, iv. Bureaucratic issues (emphasis on KPIs). v. Availability of alternative VLE/social media. platforms.
Symfony	• Regular national school. • Limited boarding for underpriviledged students. • Urban location.	Moderate	Moderate	IU (16 + 4 T2) SA (8) CA (7) CT (4)	i. Frog Champions to assist teachers. ii. CPD in smaller groups based on VLE competencies. iii. Some proactive teachers using own ICT equipment for teaching	i. ICT infrastructure issues (lack of computers in good working condition, slow internet). ii. Teachers' professional ethics (using school wifi for personal activities). iii. Workload and time management.

School	School Background	Extent of VLE Utilisation for Teaching & Learning	VLE Learning Site Development	Teacher ICT Integration Model (potential number of teachers) T2: IU Type 2	School Infrastructure & Support Metrics	VLE Utilisation Challenges
					and learning with ICT/VLE integration. iv. Recognitions to teachers and students regarding VLE utilisations.	iv. Perceived less user-friendly VLE features. v. Exam-oriented education. vi. Availability of alternative VLE/social media platforms.
Pascal	• Fully residential / boarding religious (Islamic) school. • Sub-urban location. • High-performance School & School of Global Excellence recognitions.	Moderate	Moderate	SA (11) IU (9 + 1 T2) CA (2) CT (2)	i. Good ICT infrastructure (adequate equipment, excellent internet connectivity, students' personal iPads). ii. Adequate support (technical assistance and CPDs).	i. Availability of alternative VLE platforms. ii. Exam-oriented education. iii. Workload and time management.
Fortran	• Regular natonal school. • Urban location.	Moderate	Moderate	IU (23 + 5 T2) SA (9) CA (3)	i. Consistent CPDs for teachers ii. Recognitions to teachers and students	i. Exam-oriented education.

School	School Background	Extent of VLE Utilisation for Teaching & Learning	VLE Learning Site Development	Teacher ICT Integration Model (potential number of teachers) T2: IU Type 2	School Infrastructure & Support Metrics	VLE Utilisation Challenges
	• Cluster School recognition.			CT (2)	regarding VLE utilisations.	ii. Teachers' attitude (not practising what they learnt through CPDs). iii. Workload and time management. iv. ICT infrastructure issue (slow internet).
Pixel	• Regular natonal religious (Islamic) school. • Limited boarding for underpriviedged students. • Rural location.	Moderate	Moderate	IU (15 + 2 T2) SA (11) CA (2) CT (2)	i. Good rapport between teachers and students. ii. Teachers' beliefs (priority in giving the students access to the VLE and educational resources). iii. Adequate support (technical assistance and CPDs).	i. ICT infrastructure issues (lack of computers in good working condition, slow internet). ii. Lack of funding for ICT prevention and maintenance costs. iii. Teachers' attitude (reluctant to change). iv. Time constraint (to prepare and implement).

CHAPTER 5: DISCUSSION

5.0 INTRODUCTION

The previous chapter has described the findings from this research according to individual case study analysis as well as a cross-case examination involving the five schools. With reference to the findings, this chapter aims to address the research questions underpinning this study. In doing so, the discussion in this chapter attempts to answer the research questions by explaining the findings in association with the theories used in this study. Furthermore, this chapter also includes comparisons with relevant studies highlighted in Chapters 1 and 2 as well as other literature on the utilisation of a VLE platform in teaching and learning.

5.1 The Overall Inquiry: To what extent did teachers utilise the VLE platform and what was the main utilisation purpose in teaching and learning?

In order to gauge the extent of the teachers' utilisation of the VLE platform, this study adopted a usage indicator set in the study by Md. Keling, Madar and Abd. Salam (2013) whereby utilisation of between 5 to 10 times per month was considered as moderate. Furthermore, data from the OECD's TALIS report regarding the average teaching hours per week for Malaysian teachers was referenced as the basis to calculate the teachers' actual utilisation of the VLE platform per month. The findings in this study as elaborated in Chapter 4 demonstrated that the teachers' actual utilisation of the VLE platform was at a moderate level. Hence, it replicated the finding from the study conducted by Md. Keling et al. (2013) who also revealed that the teachers' usage of the VLE

platform was moderate. The finding in this study was different compared with the 2018 report issued by the National Audit Department of Malaysia, in which it was indicated that utilisation of the VLE platform was at a low level. Nevertheless, this study only focused on the utilisation extent by teachers whereas the scope of investigation for the 2018 National Audit Report covered both the teachers and students. In spite of the difference in the scope of study, the results from the audit report as well as the academic studies substantiate the suggestion that after 6 years of implementation, the utilisation level of the VLE platform in Malaysian national schools is stagnant between low and moderate levels. Section 5.2 will attempt to describe the potential reasons behind the usage levels.

Meanwhile, results from this study found similarities with the work by Soon (2014), whereby there were varying degrees of utilisation of specific features available on the VLE platform. For example, whilst in general there were many teachers who utilised the VLE to send or assign homework to students, feedback regarding the students' homework occurred less often via the platform. Results from the survey conducted by Soon (2014) indicated that 47.5% of the teachers used the 'send homework' attribute while 31.4% gave feedback to the students via the VLE platform regarding their homework. In this current study, 62.4% of the teachers utilised the 'assign homework' feature and 47.6% gave feedback to the students using the VLE platform. Based on the results, there was evidence of improvements with regard to the teachers' utilisation of specific features available on the VLE platform. In particular, there was a 14.9% increment in the teachers' utilisation of the 'assign homework' feature and 16.2% improvement associated with the attribute to 'give feedback' to the students' homework via the VLE platform.

As described in the 2018 National Audit Report (Jabatan Audit Negara, 2019), since 2015 the MoE has implemented several strategies targeting the school community to increase the utilisation of the VLE platform. The strategies include circulars, VLE-related KPIs and regular promotional activities nationwide. Hence, these strategies have likely contributed to the increase in the utilisation of the VLE platform among the teachers. Nevertheless, despite the increase, the survey results in both studies indicated that the attribute of giving feedback to students was still only utilised by less than half of the overall teacher respondents. Based on analysis from this study, it was identified that the teachers preferred to have face-to-face communication in the classroom to discuss or give feedback regarding the students' homework, as opposed to using the VLE platform. The main reasons cited was for convenience purpose, particularly in relation to addressing common weaknesses or mistakes performed by the students. Hence, this portrayed that integration of the VLE platform occurred as part of a blended teaching and learning approach, whereby as described by Fleck (2012), the lessons involved a combination of face-to-face interactions and online activities. More importantly, it provided evidence to support the ideas highlighted by Ronad and Blanco (2016), Small, Dowell, and Simmons (2012) and Belair (2012) in which although technology such as the VLE is an important enabler for students' learning, the teachers' face-to-face interactions and counsel are still relevant.

In addition, findings from this study suggest that access to the VLE platform does influence the extent of utilisation, including for the teachers to assign homework or give feedback to the students. Schools that have good ICT infrastructure, such as Avatar and Pascal, recorded higher utilisation of the VLE platform (integration

for teaching and learning as well as for homework and feedback) compared with the other case study schools. In line with the concept of ubiquitous learning associated with the VLE, access to the virtual platform is neither restricted to the classroom nor the school compound. Findings from this study indicated that students with good access to the VLE at home (case study Fortran) also tend to have more active communication via the platform with their teachers regarding homework and feedback.

Nevertheless, as highlighted in 4.6.2 (b), results from this study indicated that the VLE platform was rarely used for communication with the students' parents. Preference to engage in interactions via other social media channels as well as problems with internet access were the main reasons cited for the lack of utilisation of the particular communication feature on the VLE platform. This finding provides further evidence to support previous studies such as by Álvarez, Martín, Fernández-Castro, and Urretavizcaya (2013), Lameras, Levy, Paraskakis and Webber (2012) and Soon (2014) who indicated that features available on the VLE platform have not been fully exploited by the intended users. While the results from this study suggest that there was less frequent exploitation of the VLE's communicative feature, in the context of the case study schools, the VLE platform was mostly utilised by the teachers to provide additional teaching and learning resources for the students. Hence, referencing the categories of VLE use as suggested by Lameras et al., (2012), utilisation of the VLE platform in this study was predominantly for Category A, in which emphasis was to allow learning to take place at any time and any place as a result of the learning platform viewed as "an efficient, one-stop repository for items" (Lameras et al., 2012:145). The following section will attempt to delve into the reasons why utilisation of the VLE

platform was stagnant at Category A, despite the MoE's encouragement for implementation of 21st century teaching and learning pedagogy.

5.2 Research Question 1: What are the significant factors influencing the teachers' utillisation of the VLE platform?

Analysis of data from the study has identified three main themes associated with the significant factors influencing the teachers' utilisation of the VLE platform. The three main themes are (i) suitability for the education system, (ii) teacher-related factors and (iii) student-related factors. The following sub-sections further elaborate on the themes (in non-specific order) relating to Research Question 1.

5.2.1 Theme 1: Suitability for The Education System

As elaborated in Chapter 4, theme 1: suitability for the education system describes the relevance of the VLE platform in supporting the implementation of for instance the curriculum, subject syllabus and students' assessments. Results from analyses of the quantitative and qualitative data in this study have indicated that the VLE platform is suitable to be integrated in teaching and learning across curriculum and subjects. In Chapter 2, it was described that based on the study by Howard, Chan, and Caputi, (2015), subject areas influence the extent of technology integration. Their study found that Science teachers reported a higher frequency of technology integration whilst Mathematics had the least number of technology-enhanced lessons. Wastiau, Pagano, and Garoia (2013) suggested that conventional assessment methods requiring students to present and explain calculation procedures have potentially contributed to the lack of motivation in experimenting with innovative technology-enhanced pedagogy among Mathematics teachers.

In the current study, some of the participants in one school (Pascal) suggested that integration of the VLE platform was less suitable for Mathematics subject. In particular, Lily who taught Mathematics and Additional Mathematics subjects preferred the traditional teaching method using chalk and talk to explain Mathematical solutions to her students. This was reiterated by her students, Juni and Aini, via a separate interview session. The students emphasised that it was easier to understand solutions to Mathematical problems and show detailed explanation of the solutions through face-to-face interactions between the teacher and students. Therefore, the examples from Pascal provided evidence to support the suggestion by Wastiau, Pagano and Garoia (2013).

Nevertheless, evidence from the other case study schools such as Pixel and Fortran indicated the suitability of the VLE platform integration including for the Mathematics subject. The participants described how the integration of the VLE platform in various subjects including Mathematics served as a catalyst to facilitate better understanding of concepts via the application of specific software, videos and notes. In one example, Maggie (Mathematics teacher in Fortran) described how she utilised an animation software to explain the concept of 'rotation' to her students. In addition, the educational resources available on the VLE platform particularly the quizzes and educational games served as supplementary exercises that enhanced the students' understanding of contents and prepared them for examinations. Rosalind (Additional Mathematics teacher in Fortran) and Ismail (Mathematics teacher in Pixel) emphasised that the exercises, quizzes and educational games on the VLE platform enabled their students to practise more questions related to higher-order thinking skills. Hence,

the examples from Fortran and Pixel correlate with the previous studies conducted by Hegedus, Dalton and Tapper (2015) and Chandra and Briskey (2012) who reported suitability of technology integration in teaching Mathematics.

The teachers' beliefs and their competency as according to the TPACK framework played a significant influence in determining the suitability of the VLE integration, and hence their utilisation of the platform for teaching and learning. For example, as certified Mathematics and Additional Mathematics teachers, Lily, Maggie, Rosalind and Ismail were content experts in the subjects. Furthermore, as teachers in national schools in Malaysia, it had been compulsory for them to attend formal teacher training courses that included knowledge on pedagogy. Based on classroom observations and interview sessions in this study, Maggie, Rosalind and Ismail demonstrated good technological knowledge since they were avid users of the ICT. Meanwhile, Lily was conversant with the integration of the VLE platform in teaching and learning, despite showing lack of interest in ICT in education. Nevertheless, what differentiated Lily from Maggie, Rosalind and Ismail was their beliefs particularly regarding the students' assessments and the utilisation of the VLE platform in teaching and learning.

Pascal and Fortran were two schools that placed great emphasis on students' examinations and academic results. As a teacher in Pascal, Lily believed on the importance of her students gaining good academic results. Hence, Lily's pedagogy focused on preparing her students for formal examinations. Furthermore, despite having some knowledge in technology and competent in pedagogical and content knowledge, Lily preferred to use the traditional teaching

approach because she elaborated that it was difficult to show Mathematical solutions on the VLE platform. Similarly, Maggie and Rosalind (case study Fortran) acknowledged the importance of examinations for the students. However, they frequently integrated the VLE platform while teaching Mathematics and Additional Mathematics because they had seen and experienced the potential benefits that resulted from the utilisation of the VLE platform. Further elaborations regarding the potential benefits will be discussed in 5.2.3 and 5.3.

5.2.2 Theme 2: Teacher-related Factors

Theme 2: teacher-related factors centralise around circumstances associated with the individual teachers, such as the teacher's belief and competency in ICT integration for teaching and learning. The literature in Chapter 2 has suggested that as part of the teachers' beliefs, their definitions of the purpose of education, their chosen pedagogical approaches and perceptions on students' assessments develop over time based on the teachers' experiences as well as other change factors (Clarke & Hollingsworth, 2002; de Vries et al., 2013; Sang et al., 2011). Findings from this study have indicated that one of the significant factors shaping the teachers' beliefs and influencing their utilisation of the VLE platform was due to an external factor, specifically the need to adhere to instructions from the superiors such as the school administrators and the MoE in general.

As highlighted in Chapters 1 and 2, education in Malaysia maintains a centralised hierarchical system. Nevertheless, the implementation of the Malaysia Education Blueprint (MEB) 2013-2025 marked the MoE's agenda to transform the education system among others by empowering more autonomy to school administrators

and welcoming active participations from the educational stakeholders (Bush et al., 2018; Ministry of Education Malaysia, 2013). However, Bush et al. (2018) suggested that transforming school leadership practice in Malaysia and some neighbouring Southeast Asian countries with centralised education systems is difficult to achieve because of the cultural expectations within their societies. In their study, Bush et al. (2018:1259) revealed that instructional leadership among school administrators in Malaysia was "highly prescriptive, based on policy imperatives". With regard to this study, the MoE had disseminated official letters encouraging teachers to utilise the Frog VLE and develop learning sites on the VLE platform. In addition, each year the national schools were expected to achieve a set of Frog VLE KPIs. The concept of hierarchical cultural practise is evident as school administrators in Malaysia exercised their instructional leadership approach to execute the policy directive from the MoE. Subsequently, the majority of teachers utilised the VLE platform mainly to adhere to instructions firstly from the school administrators and ultimately the MoE.

Results from this study indicated some examples of teachers such as Lily (case study Pascal) and Kareena (case study Fortran) who continued to utilise the VLE platform because of the KPIs and instructions. There were other teachers who felt a sense of responsibility to help the school achieve the KPIs. However, the teachers continued with the utilisation because they also experienced the perceived benefits or salient outcomes from the VLE integration. Findings from the qualitative data analysis in this study observed that Kathy (case study Symfony), Wardina and Ismail (case study Pixel) and Rosalind (case study Fortran) were teachers who in the first place had some interest in technology or ICT in education. In other words, based on the Interconnected Model of Teacher

Professional Growth, these teachers held a belief (personal domain) that utilisation of the VLE platform has potential benefits for themselves as well as for their students. After going through the process of professional experimentation (domain of practise), Kathy, Wardina, Rosalind and Ismail highlighted that they had either experienced for themselves or seen evidence of salient outcomes (domain of consequence) from the VLE utilisation. For example, Kathy's self-reflection highlighted the physical space-saving advantage while Ismail acknowledged that his students were excited to answer Mathematical exercises via Quizziz or Kahoot activities on the VLE platform.

Meanwhile, it has been suggested in Chapter 2 that one of the best ways to get buy-in from the teachers is by increasing their knowledge and skills. In the case of the VLE integration, the teachers firstly need to be aware of particularly the potential benefits from utilisation of the VLE platform. Secondly, it is also crucial for them to understand how to integrate the technology in teaching and learning. From the perspective of the TPACK framework and as specified by Ertmer et al. (2012), teachers who are competent in the technology, pedagogical approach, content knowledge and aware of the VLE's beneficial prospects can maximise the potential output from the integration in teaching and learning. The results from this study did portray a correlation between the teachers' competency in using the VLE platform and the extent of the teachers' VLE integration in teaching and learning.

Findings from this study indicated that the teachers self-assessed themselves as having between low to intermediate skill levels in utilising Frog VLE in teaching and learning. Similarly, the result regarding the teachers' actual integration of the

VLE platform in teaching and learning did not surpass the moderate level. The perception regarding the competency in VLE utilisation was a reflection of the teachers' self-efficacy. According to Bandura (1994) as cited in Lyons and Bandura (2019:9), self-efficacy refers to "an individual's beliefs about their capabilities to produce at designated levels of performance". Zheng, Yin and Li (2019) described that teachers' self-efficacy influences their teaching practices. Hence, results from this study suggest that one of the possible reasons contributing to the moderate Frog VLE utilisation was because the majority of the teachers perceived themselves as having between low to intermediate skill levels.

Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur (2012) proposed that teachers must be given the opportunity to participate in CPD and hands-on sessions in order to try changing their beliefs and actions. Clarke and Hollingsworth (2002) emphasised that CPD sessions should promote on-going and life-long learning for teachers via formal and informal activities. In this study, some schools had already implemented such practical activities and CPD sessions as highlighted by Ertmer et al. (2012) and Clarke and Hollingsworth (2002). For example, CPD sessions in Symfony were conducted in small groups based on the teachers' Frog VLE competency to facilitate better hands-on sessions. In addition, the group of Frog Champions in Symfony and the team of young teachers who acted as VLE troopers in Avatar were established to provide assistance to other teachers particularly via informal coaching sessions. The customised support proved beneficial in making teachers in Avatar and Symfony feel more comfortable and ready to utilise the VLE platform. Results from the teachers' survey in both schools indicated that the respondents received

adequate assistance when they had problems with Frog VLE. Hence, the majority of teachers in Avatar and Symfony reported that apart from utilising VLE platform for teaching and learning, they also utilised it for various administrative purposes.

5.2.3 Theme 3: Student-related Factors

Results from this study indicated that several factors associated with the students also contributed significantly to the teachers' utilisation of the VLE platform in teaching and learning. For example, there were evidences in every case study school that highlighted the students' attentiveness and increased interest during lessons with Frog VLE integration. Sheila (case study Avatar) described how her students "became more focused" in class. Nazim and Fazilah (case study Pascal) emphasised that their students were more motivated and there were increased participations during group activities and class discussions. These findings were in line with the report presented by Rabah (2015) who observed higher interest and participation among the students during lessons with technology integration as they were able to explore educational resources beyond the traditional classroom and textbooks.

One of the most common feedback points gleaned from the qualitative data analysis was the noticeable interest and motivation among the students emerging from their participations in lessons that included gamifications and quizzes. Teachers such as Nazim (case study Pascal), Ismail (case study Pixel) and Saleha (case study Avatar) elaborated that they felt encouraged to keep incorporating the VLE platform in teaching and learning particularly after observing that their students enjoyed doing activities based on educational games and quizzes. Findings derived from the data analysis encompassing

interviews with the students revealed that the majority of them preferred to study or participate in activities involving gamifications and quizzes on the VLE platform because it was a fun alternative to learning and doing revisions. Hence, the teachers in this study who utilised the VLE platform to implement educational games and quizzes were able to motivate and engage the students in the learning process because the types of activities suited the students' preferences.

Simultaneously, the engagement and active participations from the students during the lessons created more opportunities for the teachers to achieve the teaching and learning objectives. Apart from conducting teaching and learning activities that are able to motivate and engage active participations from students, it is also important for the teachers to utilise the technology to complement the students' learning styles and needs. Cameron (2015) has suggested that it is easier for teachers to meet the students' developmental needs, learning goals and curriculum by deliberately choosing the type of technology and applications to be utilised for teaching and learning. In this study, teachers such as Nazim, Ismail and Saleha utilised educational game applications in particular Kahoot! and Quizziz. Meanwhile, Wardina (case study Pixel) explained that she utilised the VLE platform to include audio-visual resources with her lower-end classes to cater for the students' learning needs and competence levels.

Findings from this study implied that teachers also took into consideration the potential benefits from the VLE utilisation for the students, before deciding whether or not to incorporate the learning platform in teaching and learning. According to Roslina (case study Symfony), her Geography lessons entailed a lot of group assignments and collaborations among students. Therefore, the

utilisation of the VLE platform were deemed beneficial for the students because the group tasks could be implemented virtually instead of having to set time and place to physically meet for discussions. Furthermore, Roslina's students reiterated that discussion materials could be shared via the VLE platform, not only with the group members but also with the whole class and the teacher. Simultaneously, sharing of the discussion materials via the VLE platform helped to reduce paper consumption and physical storage of the educational resources.

With regard to the educational resources, the teachers acknowledged that the VLE platform served the students with access to a plethora of knowledge and study references. Amira (case study Avatar), Roslina (case study Symfony), Fazilah (case study Pascal) and Dewi (case study Pixel) believed that access to a wide range of online educational resources enabled the students to become independent learners, assist their understanding of topics and be better prepared especially for academic assessments.

5.2.4 Barriers That Hinder Teachers' Utilisation of The VLE Platform

The literature review in Chapter 2 has indicated the importance of identifying barriers to change because the barriers can hinder implementation efforts. Results from this study demonstrated that challenges affecting the teachers' utilisation of the VLE platform in teaching and learning were present in the categories of first-order and second-order barriers. The most prominent challenge in the category of first-order barrier that existed across all the case study schools was related to time constraints. Based on the study, teachers expressed that a lot of time and effort were spent preparing materials for the lessons that utilise the VLE platform. This problem was similar to the findings

regarding the lack of time as reported in previous studies such as by Albugami and Ahmed (2015) and Frost and Sullivan (2006).

Results from the current study indicated that some teachers attributed the issue of insufficient time with the workload associated with their professional practice. Hence, this attribute echoed with findings from two previous studies conducted by Raman and Yamat (2014) and Simin and Sani (2015) who reported that Malaysian teachers cited lack of time as a barrier to ICT integration for teaching and learning due to their other responsibilities as teachers. In this current study, some of the teachers also highlighted that they experienced time constraint during the 30 minutes (one period) lessons to conduct classroom activities that utilised the VLE. Nevertheless, the nature of the VLE that enabled ubiquitous learning meant that despite the challenge to utilise the VLE during classroom sessions, it was possible for the teachers to assign tasks that involved utilisation of the platform as part of the students' homework.

In addition, issues regarding the lack of ICT infrastructure to support the implementation of lessons with the VLE integration were reported in the regular national schools (Symfony, Fortran and Pixel). Although the issues were not critical, the availability of only a small number of computer units, computer laboratory or classrooms with LCD projectors meant that teachers and students in the schools had limited access to the ICT facility and the VLE platform during school hours and within the school compounds. In order to overcome the shortage of ICT infrastructure, some teachers in Symfony had proactively brought their own laptop and LCD projectors to be used for teaching and learning. Nonetheless, besides the issue regarding insufficient ICT infrastructure, internet

connectivity in the regular national schools was also slower compared to the speed in the fully residential schools (Avatar and Pascal). Hence, in the case of the proactive teachers in Symfony, despite having the laptops and LCD projectors, buffering still occurred thus interrupting access to the online resources on the VLE platform.

According to the Senior Assistant in Symfony, based on findings from a small scale survey conducted by the school, one of the reasons for the slow internet connectivity was due to the behaviour of teachers using the school wifi during school hours for personal reasons. The MoE has provided basic wifi facility to all national schools in the country. At the time of data collection for this study, the internet speed in most national schools in Malaysia was on average between 4Mbps to 30Mbps (Ministry of Education Malaysia, 2013). Such limited average bandwidth had often resulted in internet bottlenecks or slow network speed during high utilisation of the network or too many people sharing the same wifi system. Indeed, the speed of the internet connectivity influenced the utilisation of the VLE platform in teaching and learning.

While issues regarding internet speed (which is a first-order barrier) can be dealt with via several methods such as increasing the bandwidth or scheduling usage of the school wifi during school hours, it is difficult to address the ethical issue related with the behaviour of using the school facility for personal reasons. As a second-order barrier, the issue regarding the teachers' behaviour is derived from their attitude and belief about professional ethics as well as technology integration in teaching and learning. It has been highlighted in Chapter 2 that second-order barriers affect the implementation of educational innovations, and

are difficult to tackle because these barriers are less tangible and more personal to the teachers (Donnelly et al., 2011; P. Ertmer, 1999; Kim, Kim, Lee, Spector, & DeMeester, 2013).

Another example of a second-order barrier that is associated with the teachers' belief is the teachers' lack of commitment to practise utilising the VLE platform after their CPD sessions, as reported by the Senior Assistant in Fortran. Therefore, the VLE utilisation level among the teachers such as in Fortran remained moderate, while the available widgets on the VLE platform were still underutilised. There are several possible factors contributing to this scenario, but one reason is the teachers' belief regarding the potential benefits and importance of the integration of the VLE platform in teaching and learning.

5.3 Research Question 2: How does the utilisation of the VLE platform affect the teachers' professional practice?

Literature has suggested that the teachers' professional practice refers to their responsibilities associated with the different aspects of teaching such as planning, preparation and execution of lessons, classroom management and other administrative obligations (Bahagian Pendidikan Guru, 2009; Danielson, 2008; Jones & Cowie, 2011). Findings from this study have identified some examples of the potential benefits that teachers reaped from utilisation of the VLE platform. For example, integration of the VLE platform in teaching and learning facilitated easier explanation of otherwise complex learning concepts.

As described in 5.2.1, Maggie (case study Fortran) utilised particular software embedded on the VLE platform to visualise certain Mathematical concepts. Similarly, Sheila (case study Avatar) optimised the VLE platform to share videos of the Hajj pilgrimage with her students so that they could get some insights regarding the venues and observe the implementation of the Hajj rituals. In addition, Amira (case study Avatar) explained that the students were able to get immediate answers when attempting online quizzes or questions embedded in the educational games on the VLE platform. Thus, as a teacher, Amira highlighted that she also gained benefits by solving the problem of marking the students' books that was otherwise time consuming. Hence, these examples correspond with the previous findings by Tunmibi, Aregbesola, Adejobi and Ibrahim (2015) who reported that teachers in their study believed that the VLE has made teaching easier and more efficient.

Garrett Dikkers (2015) has suggested that the integration of ICT in education enables a focus on 21st century pedagogy and the enactment of student-centred activities such as inquiry-based learning. On a similar note, Nazim (case study Pascal), Saleha and Amira (case study Avatar) as well as Ismail (case study Pixel) explained that the ability to access educational materials at anytime and anywhere via the utilisation of the VLE platform has facilitated easier implementation of the modern pedagogical approaches such as the flipped classroom and 21st century teaching and learning methodology. As described in 5.1, the learning platform was viewed by participants in this study as an efficient, one-stop repository for educational references. There were multiple evidences projected by the teachers and students that emphasised the VLE platform's ability in providing access to a wide range of educational resources. Thus, this was in

line with the previous findings by Simin and Sani (2015) who reported that teachers in their study benefited from the plethora of teaching and learning resources available on the VLE platform, to create engaging lessons that suited their students.

However, despite the efforts shown by teachers such as Nazim, Saleha, Amira and Ismail in maximising the VLE platform to support contemporary pedagogical approaches, results in this study indicated that Frog VLE was predominantly utilised to provide additional teaching and learning resources for the students, and not necessarily to promote student-centred activities. This occurrence is akin to the findings in previous studies by Johnson-Martin (2012) and Won (2010) who reported that despite undergoing CPD sessions and recognising the potential benefits of technology in education, teachers' ICT integration in teaching and learning was only at a superficial level. Therefore, in the Malaysian context, the MoE has fulfilled the objective of providing a VLE platform that serves as a repository for educational resources. However, the utilisation of the VLE at a superficial level hampered the MoE's effort in encouraging the development of 21st century skills among students.

The MoE aims to leverage ICT to scale up quality learning for Malaysian students, in order to prepare them to be adept at utilising technological capabilities to succeed in the modern global societies. It has been highlighted in Chapter 2 that Scott (2015), Tondeur, Forkosh-Baruch, Prestridge, Albion and Edirisinghe (2016) as well as Voogt and Plomp (2010) have suggested that in order to support students with competencies for the modern global societies, teaching and learning should focus more on interactive learner-led activities, enabling the

students to develop 21st century skills involving critical thinking, creativity, collaboration and communication. Reasons cited as the barriers that hindered teachers' utilisation of the VLE platform (described in 5.2.4) provide potential explanations as to why utilisation of the learning platform has yet to translate into increased adoption of the 21st century teaching and learning pedagogy.

With regard to the teachers' involvement in learning site development, results from this study suggested that the most challenging phase for the teachers was at the beginning stage. The teachers reported that they spent a lot of time and effort to develop suitable teaching and learning materials using the widgets and links available on the VLE platform. To illustrate the time consuming process, teachers such as Maggie and Rosalind (case study Fortran) and Ismail (case study Pixel) who were actively involved in developing their own learning sites explained that they sacrificed time in school and at home to complete their tasks, to the extent that they agreed at first it was burdensome to create materials for the learning sites. Nevertheless, Maggie, Rosalind, Ismail and the other teacher participants in this study emphasised that the VLE platform provided them with an efficient cloud storage facility for their teaching and learning materials. Therefore, once they have a collection of materials stored on the VLE platform, it became easier to retrieve lesson plans and teaching resources for reference or usage with other classes. The cloud storage facility also meant that the teachers were able to save physical space and reduce paper consumption, thus contributing positively to the environment.

As elaborated in Chapter 4, the result from the cross-case analysis indicated that in schools where the majority of teachers self-assessed themselves as having

intermediate skills with regard to learning site development, the total number of learning site that had been developed was higher compared with the results in the other case study schools. Among the potential factors contributing to this result was the implementation of individual programmes that offered the teachers hands-on assistance and personalised support based on their competence levels. Examples of such programmes were the Frog Champions and small-group CPDs in Symfony and the VLE troopers in Avatar. However, the cross-case analysis also revealed that having developed more learning sites did not necessarily lead the teachers to increase their utilisation of the VLE platform in teaching and learning. This was in contrast with the findings by Cviko, McKenney and Voogt (2014) who suggested that teachers involved in designing digital educational resources demonstrated higher integration of ICT in teaching and learning. In the context of the current study, it was possible that the teachers developed the learning sites mainly to fulfil the KPI which focused on the number of learning sites developed and shared by the teachers on the VLE platform's Frog Store. In addition, the hands-on assistance and personalised support provided to teachers in some schools meant that more learning sites were possibly developed as output from the CPD programmes. Despite having developed a moderate number of learning sites, the barriers that have been elaborated in 5.2 could also be the contributing factors that affected the teachers' integration of the VLE platform in teaching and learning.

5.4 Research Question 3: How does the integration of the VLE for teaching and learning affect the teacher-student relationship?

According to Scott (2015), teachers in the 21st century are learning coaches who provide guidance and support in facilitating students to become independent learners, experience lifelong learning and attain their individual goals. This demands more active communication and collaborations between the teachers and students, compared with the traditional role of teachers prior to the 21st century. Results from the study indicated that there had been increased communication between the teachers and their students as a result of the VLE integration that allowed access to an array of educational resources without the limitation of time and place. As independent learners, the students were able to read articles, answer exercise questions or quizzes, play educational games and explore the VLE for further information at their own time and pace. It was reported in Symfony, Pascal, Fortran and Pixel that the advantage of ubiquitous access allowed the students more time to delve into the learning resources and extra opportunities to ask questions to their teachers regarding homework and the subject content.

Unlike the traditional pedagogy whereby questions and answers were confined to formal lessons and school hours, the integration of the VLE allowed for communications to occur at any time including via the platform itself. Students such as Dafi, Diana and Kemmy (case study Symfony) and Izza, Juni, Najwa and Fatima (case study Pascal) reported that they gained confidence to ask more questions to their teachers because they had the option of doing so online on the VLE platform or through other social media channels, as well as during face-to-face interactions in school. However, the results from the cross-case analysis

demonstrated that more than half of the teacher participants in this study did not give feedback to their students' homework or questions via the VLE platform. Findings from the qualitative data analysis revealed that the teachers preferred to give the feedback via face-to-face communication in the classroom, for convenience purpose in addressing common issues as well as to save some time. This means that although the communication features available on the virtual platform had not been fully utilised, there was nonetheless greater frequency in the teacher-student interactions arising from activities or assignments that involved utilisation of the VLE in teaching and learning.

The teachers' changing roles from the focal point of information in the classroom to learning coaches were observed in case study schools where some lesson activities adopted 21st century teaching and learning pedagogy. During the classroom observations, lessons conducted by Saleha (case study Avatar), Wardina and Ismail (case study Pixel) and Roslina (case study Symfony), involved students working collaboratively in small groups. The students explored the VLE to find relevant information for them to creatively accomplish their assignments. Ismail explained that with the VLE utilisation, the students became more interested in their lessons and often asked a lot of questions to the teacher for clarifications. In addition, the teacher supervised and gave feedback to the students' findings and group presentations, hence demonstrating the role of a learning coach or facilitator. Such collaborations between the teacher and the students, as well as among students via the group activities were examples of a shared learning process such as highlighted by Carlson (2016), Morley (2015) and Yin (2013). Another example of a transformation of the teacher-student relationship that portrayed a collaboration and shared learning process was

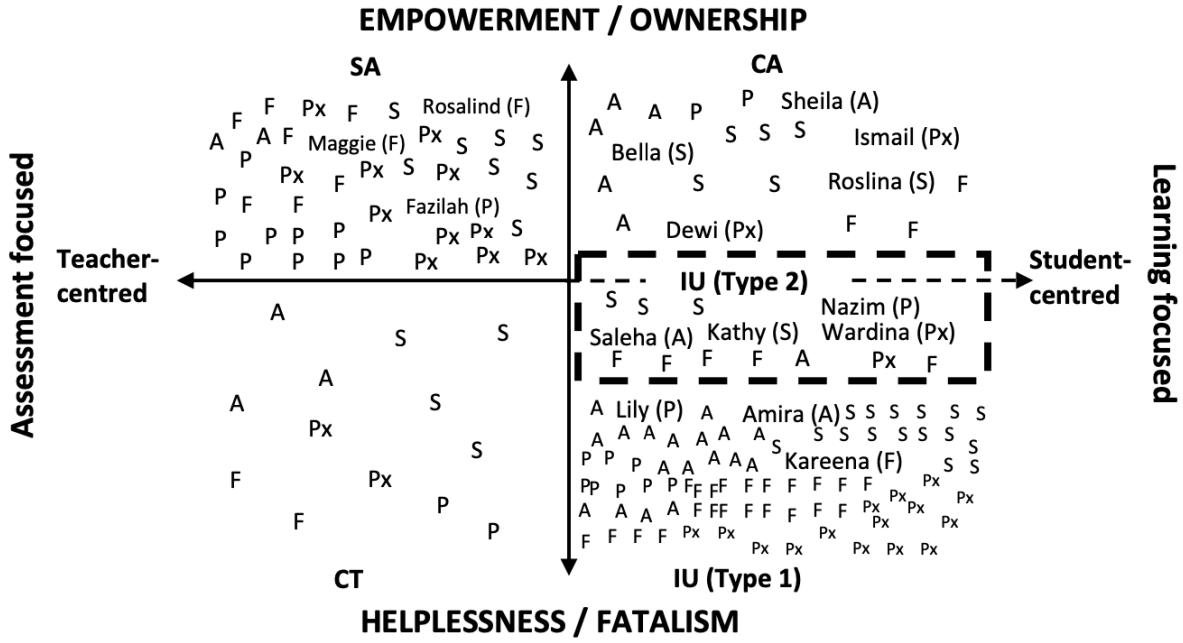
evident in Pixel when the students were able to influence some teachers to utilise the VLE platform in teaching and learning. Thus, the examples have provided contrasting testimonies to the concerns of some teachers in the study conducted by Yin (2013) who perceived that technology integration in teaching and learning had caused the students to lose their communication skills and diminished the teachers' role in the students' learning experience.

5.5 Research Question 4: How do the teachers relate to the Teacher ICT Integration Model and what are the implications for the utilisation of the VLE platform in post-primary national schools in Malaysia?

As illustrated and elaborated in Chapter 2 (see Figure 3), the Teacher ICT Integration Model which was proposed by Donnelly et al. (2011) described teachers' utilisation of ICT in education according to four categories namely the Contented Traditionalist (CT), Selective Adopter (SA), Inadvertent User (IU) and Creative Adapter (CA). Findings from this study indicated that all four categories of teachers existed in each of the case study school. Analysis from the quantitative data suggested that the majority of the teachers were in the category of IU, due to the tendency to utilise the VLE platform because of adherence to instructions from the school administrators as well as the MoE (see Figure 44). Based on the Teacher ICT Integration model, teachers in the category of IU are described as utilising the technology in education "from a sense of external pressure and/or a certain mixture of curiousness but with hesitation" (Donnelly et al., 2011:1479).

The previous chapter has recommended two types of IUs, namely the IU Type 1 and IU Type 2, emerging from the analyses of both the quantitative and qualitative

data in this study. The IU Type 1 represents a teacher as described by Donnelly et al. (2011) in the Teacher ICT Integration model. This study proposes IU Type 2, to portray a teacher who *voluntarily* utilises the VLE platform but places external circumstances such as adherence to instructions as an important factor supporting the action.



CT: Contented Traditionalist	IU (Type 1): Inadvertent User (Type 1)
IU (Type 2): Inadvertent User (Type 2)	SA: Selective Adopter
CA: Creative Adapter	A: Avatar
S: Symfony	P: Pascal
F: Fortran	Px: Pixel

Figure 44: Distribution of Respondents According to The ICT Integration Model.

Based on Figure 44, Saleha, Nazim, Kathy, Wardina and ten other teachers from Avatar, Symfony, Fortran and Pixel were examples of potential IU Type 2 teachers who had keen interest on ICT and utilised the VLE platform voluntarily yet also viewed adherence to instruction as a significant factor for their actions. As elaborated in 5.2.2, the external factor of adherence to instructions was part

of cultural expectations in a centralised hierarchical education system typically practised in the Southeast Asian region. Bush et al. (2018) highlighted that the MEB 2013-2025 has outlined an agenda by the MoE to change leadership practice in the Malaysian education system by giving schools more autonomy. Nevertheless, fulfilling the agenda is deemed challenging due to second-order barriers associated with the cultural norms. In addition, the MoE believes that many schools still require "high levels of support and close monitoring" to meet national standards (Ministry of Education Malaysia, 2013:259). Thus, leadership autonomy particularly regarding school budget and curriculum has been granted to schools in phases. Donnelly et al. (2011:1470) have indicated that second-order barriers tend to be more resistant to change because they are "typically rooted in the teachers' core beliefs". This probably explains the reason that despite the willingness to utilise the VLE platform, conforming to the cultural expectations is vital for the IU Type 2 teachers. As the centralised hierarchical education system and conforming to cultural expectations are also practised in other countries especially in Southeast Asia, it is possible to observe a replication of the IU Type 2 category if a similar study is conducted in those nations.

Donnelly et al. (2011) highlighted that the categorisation of teachers based on the ICT Integration model helped to provide some insights regarding technology integration in teaching and learning. Consequently, subsequent stakeholders such as the school administrators and policymakers in the MoE can plan and execute relevant support to transform the CTs, SAs and IUs to the role of CAs. It was suggested that "a one size fits all approach" might work for some teachers but "would be unsuccessful in adequately supporting other teachers who are grappling with other issues" (Donnelly et al., 2011:1479). The complexity of

providing support to encourage teachers' utilisation of the VLE platform was also highlighted in this study. For example, the VLE coordinator in Pixel emphasised that it was a challenge dealing with individual teacher's different pace and ability to absorb knowledge disseminated during CPD sessions. This was similar to a previous study conducted by Termit and Noorma (2015) who reported that one of the reasons for the Malaysian teachers' failure to utilise Frog VLE was because of the inability to grasp or comprehend the knowledge and skills they received from relevant trainings and CPDs. Hence, one of the approaches to tackle this issue is by encouraging schools to form their own VLE troopers or squads such as the Frog Champions in Symfony, VLE prefects in Pixel and team of young VLE teachers in Avatar. The VLE squad serves to provide a more personalised hands-on assistance to the teachers.

It has been described in Chapter 2 that focusing on suitably tailored hands-on CPDs that expose teachers to the advantages of ICT in education and guiding them on how to execute the integration is one way of attempting to get buy-in from the teachers. The Teacher ICT Integration model suggests that a solution to support the transitions of CTs and IUs to SAs and CAs on the upper quadrants is via CPDs (Donnelly et al., 2011). This is because suitably tailored CPDs have the potential to develop teachers' sense of ownership regarding how integration of ICT is beneficial for them and their students. Furthermore, relevant CPD also helps to enhance the teachers' technological, pedagogical and content knowledge. This is also in line with the understanding based on the Interconnected Model of Teacher Professional Growth whereby through inputs or stimulus such as relevant CPDs, as well as execution of the acquired knowledge, teachers can observe, experience and reflect on the consequences from the

integration of ICT in teaching and learning, thus enhancing the teachers' own sense of ownership. Howard et al. (2015) and Siew Ming, Azman, and Joyes (2010) emphasised that teachers must hold the belief that the integration of ICT in education does contain potential benefits for the students and teachers. In this study, teachers such as Nazim and Fazilah (case study Pascal) and Kathy (case study Symfony) were examples of teachers who continued utilising the VLE platform in teaching and learning after experiencing salient outcomes involving their students as well as themselves.

Meanwhile, Donnelly et al. (2011) suggested that the transition of teachers from practising teacher-centred pedagogy (CTs and SAs) to student-centred focus (IUs and CAs) would require a change in environmental factors such as the students' assessments, or other mandated changes including school culture and educational policies. In other words, problems arising from the environmental factors or mandated changes could be regarded as second-order barriers, hence are more difficult to overcome. In relation to this study, the MoE has embarked on several initiatives that are hoped to transform teaching and learning from the traditional focus on content knowledge, cognitive skills, assessments and teacher-centred approach to a pedagogy that promotes schools as learning organisations, emphasising on student-centredness and learning outcomes. The national school curricula had been reassessed and refined to promote lifelong learning as well as relevant knowledge and skills that support the holistic development of each student, in line with the aspirations of the Malaysian National Philosophy of Education (Ministry of Education Malaysia, 2013). Subsequently, students' assessments have been realigned to include formative

school-based evaluations reflecting the revised curricula and emphasis on students' holistic development. (Lembaga Peperiksaan Malaysia, 2019).

As learning organisations, Fullan, Gardner and Drummy (2019:66) suggested that students nowadays should experience "deep learning" to help them make connections between concept and the real world, "to think critically, work collaboratively, empathise with others" and be ready to confront challenges in life. In this study, the students in Roslina's lesson (case study Symfony) worked in small groups to examine real life problems involving climate change. During group presentations, the students were able to demonstrate understanding of the factors contributing to climate change and proposed some solutions to curb the issue. The Geography lesson's group assignment was part of the students' formative assessment.

Based on other classroom observations and interviews with the teachers as well as students in this study, there were more evidences of students working collaboratively in group tasks. Similarly, teachers such as Maggie and Rosalind (case study Fortran) utilised the VLE platform to demonstrate the applications of Mathematical concepts in real life situations. However, most of the other activities observed in this study did not portray the deep learning perspective as described by Fullan et al. (2019). Hence, this resonates with the reports highlighted by Stoll and Kools (2017) and Fullan et al. (2019) who indicated the lack of practice with regard to the concept of schools as learning organisations. According to Fullan et al. (2019:68), schools as learning organisations "are not happening on scale because they go against the grain of traditional schooling. The most important change required in education is cultural". In this study, apart from the IUs, many

teachers particularly in Symfony, Pascal and Fortran were potentially SAs as a result of the school culture that placed high importance on students' examination results to meet societal expectations and maintain the schools' good academic reputations. Again, attempts to transform the SAs to CAs or changing the second-order barriers involving the school culture would be complex due to the beliefs that are more innate to the teachers.

5.6 Summary

This chapter included a discussion that sought to address the research questions framing this study. In general, this study examined the extent and impact of the VLE utilisation among teachers in post-primary national schools in Malaysia by addressing four research questions. The research questions delved into areas identifying firstly the significant factors influencing teachers' utilisation of the VLE platform. Next, discussions were framed to address the impacts of VLE integration on the teachers' professional practice as well as the teacher-student relationship. The final research question sought to investigate the teachers' stance in relation with the Teacher ICT Integration model, as well as identifying the implications from the utilisation of the VLE platform in post-primary national schools in Malaysia. Further interpretations of the results associated with all the research questions were elaborated in association with the theories referenced in this study and the findings from earlier research reports.

Findings from this study indicated that the extent of utilisation of the VLE platform amongst teachers in the post-primary Malaysian national schools was similar to the findings from several other previous studies and reports. Integration of the

VLE platform was mainly to provide additional learning resources for the students, hence emphasising the VLE's function as a repository for online educational materials. Results from the study also demonstrated that many of the available features on the VLE platform particularly that facilitated communication remained unexploited and underutilised by the teachers. With regard to the first research question, several themes were highlighted relating to the education system, the teacher and the students. This chapter also included further elaborations regarding the barriers that hindered the teachers' utilisation of the platform.

Meanwhile, a discussion on the potential benefits of the VLE platform to the teachers and the teachers' involvement in learning site development formed the basis for addressing the second research question. For the third research question, findings in this study suggested that there were increased teacher-student interactions and collaborations as a result of the VLE integration in teaching and learning. Finally, this study revealed that the majority of teachers were in the category of IUs as according to the Teacher ICT Integration model. This study also suggested that cultural influence affected the classification of the types of teachers, hence the proposal for a slight adaptation to the IU category.

CHAPTER 6: CONCLUSION

6.0 INTRODUCTION

This final chapter provides a summary of the multiple-case study by addressing the key findings, implications, limitations and recommendations for future research.

6.1 KEY FINDINGS OF THE STUDY

The followings are the key findings of this study:

6.1.1 After more than 6 years of implementation of the VLE platform in Malaysian schools, the degree of utilisation for teaching and learning among post-primary national school teachers was still between low to moderate levels, which was similar to several other past studies highlighted in this thesis.

6.1.2 Utilisation of the VLE platform in teaching and learning was mainly to provide supplementary educational materials to the students. Hence, it fulfilled one of the goals of the VLE which was to serve as a repository for online educational resources. Nevertheless, utilisation of the VLE platform to provide additional resources to the students often resulted in teaching and learning that focused on content and assessment-oriented pedagogy. In other words, the implementation of teaching and learning that placed emphasis on student-centredness and learning-focused objectives was still lacking in practice.

6.1.3 The significant factors influencing the teachers' utilisation of the VLE platform in teaching and learning were categorised according to three main themes. Firstly, the utilisation was influenced by how the VLE platform was perceived to be suitable to support the education system,

particularly relating to the curricula and students' assessments. Secondly, as discussed in Chapters 4 and 5, the utilisation also depended on several teacher-related factors (such as the teachers' beliefs regarding integration of the VLE in teaching and learning as well as their VLE competency levels) while student-related factors (such as noticeable interest and motivation, ease understanding of topics) also exerted influence on the integration of the VLE platform in teaching and learning.

6.1.4 Despite acknowledging the potential benefits of the VLE platform, the utilisation in teaching and learning was perceived by many teachers as burdensome particularly at the beginning stage partly due to the time-consuming nature of preparing suitable materials to be shared with the students via the teachers' learning sites. However, many teachers found that once the materials were ready, integration of the VLE platform in teaching and learning provided them with several advantages that helped to ease their professional responsibilities.

6.1.5 There were evidences in this study which indicated that the integration of the VLE platform in teaching and learning helped to encourage more teacher-student interactions and collaborations. Students expressed confidence in asking teachers more questions due to more active participation in learning and the ability of the VLE platform to provide ubiquitous learning to the students. In this scenario, the teachers acted as facilitators or learning coaches to the students.

6.1.6 Based on the Teacher ICT Integration model, the study identified that most of the teachers were potentially in the category of the Inadvertent User (IU) because of the MoE role in encouraging teachers to utilise the platform as well as the culture to adhere to instructions from superiors and higher

authorities. In addition, there were also many Selective Adopters (SA) due to the traditional emphasis on students' examinations and academic results. The findings of this study also indicated that there were potentially some teachers who were Contented Traditionalists (CT) although the percentage was small. Meanwhile, the statistical results as well as the qualitative data analysis demonstrated that teachers in the category of Creative Adapter (CA) were the younger teachers. In the Malaysian context, this study suggests that overall it is difficult to classify teachers according to only one teacher type (CT, IU, SA or CA) because in many cases there were overlapping characteristics portrayed by the teachers. Hence, this study proposed an extension to the IU category by detailing it into IU Type 1 and IU Type 2 classifications, as elaborated in Chapters 4 and 5. The additional classification of IU Type 2 is significant because it provides a description of a category of teachers observed from findings in this study, who do not fit into the existing categorisation of teachers based on the Teacher ICT Integration model introduced by Donnelly et al. (2011).

6.1.7 As this study was conducted based on multiple-case study design, the findings highlighted some similarities and differences between the case study schools. For example, access to the VLE platform was better in the fully residential schools (case study Avatar and case study Pascal) due to the availability of good ICT infrastructure. These fully residential schools received extra funding as rewards for obtaining MoE's recognitions such as High-Performance Schools (HPS) and School of Global Excellence (SGE). Thus, the monetary advantage gave these schools the opportunities to enhance, amongst others things, their ICT infrastructure. Furthermore, schools with SGE recognition were required to procure iPads

for teaching and learning thus providing students with more ICT devices and access to the VLE platform. Meanwhile, despite having limited ICT infrastructure in the school, students living in areas with higher socio-economic background (such as case study Fortran) had good access to the VLE platform at home. Findings from this study indicated that integration of the VLE in teaching and learning was higher when the students had good access to the platform either in school or at home.

6.2 THE IMPLICATIONS OF THE STUDY

Findings from this study helped to provide some insights regarding ICT policy orientation. Firstly, ICT continues to play a significant role as an important enabler in education. As an enabler, ICT provides opportunities for wider access to knowledge, particularly with the ubiquitous nature of the VLE. The ubiquitous nature helps to promote lifelong learning for the students because access to knowledge and information goes beyond the formal classroom and school hours. Findings from this study indicated that students accessed the VLE platform not only to complete assignments but also to do revision and play educational games. In addition, this study also presented testimonies of the perceived benefits of teaching and learning that incorporated the VLE, both for the teachers and students. Thus, these testimonies and evidences of the advantages of technology-enhanced lessons help to justify the ongoing investments and developments in policy on ICT in education by the MoE not only in Malaysia but also in other countries.

Secondly, this study highlighted examples of activities and programmes that were specifically aimed to improve the utilisation of the VLE platform in teaching and

learning. For example, establishing groups such as the VLE troopers that served to provide personalised hands-on assistance with regard to VLE utilisation during formal and informal sessions proved beneficial in schools such as Symfony, Avatar and Pixel. In the Malaysian context, the MoE provided similar ICT infrastructure to all national schools and basic training for teachers to enable implementation of ICT in education programmes including the VLE. Taking into consideration the complexity of ICT integration in teaching and learning as discussed in Chapters 2 and 4, school administrators and VLE coordinators in other schools could emulate the initiatives practised in Symfony, Avatar and Pixel as additional supports to increase the utilisation of the VLE platform in their schools. At the same time, the initiatives highlighted in Symfony, Avatar and Pixel emphasise the importance of mentoring programmes to ensure that teachers' CPD sessions provide hands-on experience apart from imparting theoretical knowledge. In addition, the personalised practice sessions illustrate the importance of schools as learning organisations that cater for the teachers' professional developments as well as for the students' educational needs.

Thirdly, findings from this study suggest that the MoE needs to overcome issues regarding teachers' workload and time constraints in order to encourage more teacher participation as digital content creators. This is because despite evidences that highlighted the advantages of having the teaching and learning resources on the teachers' learning sites, the process of developing the educational materials was regarded as burdensome and time consuming by many teachers. Apart from the time constraints, issues regarding the lack of user-friendliness of the widgets and Frog VLE was described in Chapter 4. At the time of writing, the VLE deployed to all national schools in Malaysia has changed from

Frog VLE to the MoE's Digital Learning Platform. Thus, the MoE has to ensure that the new platform is easier to navigate and more user-friendly particularly with regard to encouraging teachers' participation in digital content creation. Furthermore, taking into consideration that many teachers have developed their digital educational resources in Frog VLE, the MoE needs to ensure that the Application Programming Interface (API) can interact between the Digital Learning Platform and Frog VLE or any other learning platforms. This is to ensure that the data and educational materials already developed by teachers via one particular VLE platform can safely be transferred to the cloud storage on the other learning platform. Failure to guarantee that previously saved teaching and learning materials can be transferred from one VLE platform to another has the potential to demotivate teachers from taking further part in digital content creation.

Fourthly, as described in this study, the Malaysian MoE has embarked on implementing formative students' assessments. The move from focusing on summative examinations is deemed essential in promoting more learner-centred curricula and pedagogy as well as development of the students' 21st century skills. Findings from this study illustrated examples whereby students collaborated in groups and capitalised on the VLE facility to complete assignments that were part of their formative assessments. Hence, from one perspective, the MoE's policy regarding the curricula and assessments is in line with the objectives and aspirations of developing holistic individuals who are adept with the relevant technology, as stipulated via the MEB 2013-2025, the Malaysian National Philosophy of Education and Vision 2020. Nevertheless, findings from this study also indicated that examination-oriented and teacher-

centred practice were still prevalent in some of the case study schools. It was suggested that parental expectation, school reputation and status had contributed to the teachers' execution of a pedagogy that is focused on helping students to attain good academic grades. Therefore, the MoE should identify and conduct relevant measures in order to transform the mindsets of the parents, school administrators and other educational stakeholders from over-emphasising students' academic achievements. It is vital for the MoE to convince school administrators of the importance and benefits of the VLE in contemporary teaching and learning. School administrators or leaders contribute significantly in shaping the school culture. The school culture should focus on implementing more learner-centred pedagogy whereby students have ample opportunities to think, analyse, participate in discussions and share their findings via group presentations.

Meanwhile theoretically, this study provides evidence regarding the relevance of the Teacher ICT Integration Model in the Malaysian context. In general, the model was useful in providing the basis to categorise teachers in relation to their integration of ICT in teaching and learning. Nevertheless, the cultural difference between societies in Eastern countries such as Malaysia versus the West contributed to the complexity in categorising some of the teachers according to the original model developed by Donnelly et al. (2011). Hence, this study proposed an extension to one of the teacher categories to describe and explain the emerging pattern. At the same time, the new adaptation enhances and justifies the application of the Teacher ICT Integration model in a cultural context such as that found in Malaysia.

6.3 CONTRIBUTIONS TO THE BODY OF KNOWLEDGE

This study contributes to the body of research and knowledge with regard to the utilisation of a VLE platform in teaching and learning in the context of a national policy initiative. As highlighted in Chapters 1 and 3, there are a limited number of in-depth studies regarding VLE implementation in Malaysian primary and post-primary schools, especially regarding teachers' utilisation and impact of the VLE platform. Therefore, this study helps to bridge the gap because firstly, it focused on the teachers' utilisation of the VLE platform in teaching and learning at post-primary school level. Secondly, most of the previous studies were quantitative studies that concentrated on investigating the teachers' readiness, attitudes and factors influencing the integration of the VLE platform in teaching and learning. Nonetheless, this study comprised of a multiple-case study that included quantitative and qualitative investigations of the extent and purpose of the VLE platform utilisation, the significant factors influencing the teachers to utilise the VLE platform and the impact on teachers' professional practice as well as on the teacher-student relationship. Therefore, findings from this study offer more comprehensive insights that can inform future policy reforms and initiatives regarding VLE implementation in Malaysia and other countries.

In addition, this study was framed to identify how the Teacher ICT Integration model applies in the context of hierarchical leadership culture such as practised in Malaysia. Findings from this study suggested that in the Malaysian context, there were overlapping teacher characteristics based on the four types of teachers prescribed in the model. Hence, categorising the teachers in Malaysia based on the model was a complex process. Therefore, findings from this study

also contributes to the body of knowledge associated with the theoretical model particularly when applied in a similar cultural background.

Meanwhile, the MoE has deployed a standardised ICT infrastructure to all national schools to enable technology-enhanced teaching and learning pedagogy including integration of the VLE platform. Thus, findings from this study also provides some understandings regarding common issues and challenges arising from a nationwide implementation of such an ICT initiative. Several VLE-related initiatives that were highlighted in some of the case study schools (such as the VLE troopers, procurement of additional ICT devices and small size CPD sessions) could serve as examples for other schools to replicate in their effort to encourage more utilisations of the VLE platform.

Finally, this study also contributes to the body of knowledge on teachers' participations in the development of digital learning resources. Investigations were conducted to gauge the impact regarding the teachers' involvement in developing digital educational resources such as the materials on the learning sites in Frog VLE. Findings from this study highlighted the advantages and challenges of involving teachers in digital content creation. Therefore, input from this study contributes to determine the direction regarding the future of teachers' participations in developing digital educational resources particularly for the VLE platform.

6.4 REFLECTION ON LIMITATION IN THIS STUDY

As highlighted in 1.5, this study covered an investigation regarding the utilisation of the VLE platform in post-primary national schools in Malaysia. The multiple-

case study was conducted in the state of Selangor, one of the thirteen states and three federal territories in Malaysia. Broadening the scope to involve utilisation in states other than Selangor and involving the primary national schools would potentially yield different results and findings. In addition, this study involved participants from post-primary national schools that recorded active utilisations of the VLE platform. The researcher's experience as an MoE officer helped in providing some background knowledge regarding the ICT infrastructure deployed by the MoE to the national schools. Nonetheless, the researcher's constructivist point of view shaped the need to probe responses from the beneficiaries of the ICT initiatives, in order to elicit information particularly regarding their experiences utilising the VLE platform. Involving the active users as participants in this study allowed the researcher to gain insights from the operational perspective with regard to the significant factors and strategies to increase the utilisation of the VLE platform.

It has been discussed in 3.9 that case studies do not lead to statistical generalisations of a population. However, the findings from this study may be used for thematic or fuzzy generalisation and transferability. For example, as highlighted in 6.2, results in this study suggested that establishing groups of VLE troopers were deemed beneficial in providing hands-on mentoring support for teachers regarding the integration of VLE in teaching and learning. In fuzzy generalisation, other Principals and administrators in schools with similar backgrounds can replicate the mentoring initiative in an effort to increase the utilisation of the VLE platform for teaching and learning in their schools.

Nonetheless, this study's focus on active users of the VLE platform implied a limitation. In light of this study's aim to achieve 'verstehen' or gaining a more comprehensive insight regarding the teachers' perspectives on the utilisation of the VLE platform in Malaysian post-primary national schools, it would also be beneficial to explore utilisations in schools that recorded other levels of the VLE integration. However, as the researcher was bound to comply with the Malaysian bureaucratic procedures and the time frames permitted for data collection and the PhD study, it was deemed necessary to limit the scope of this study to ensure feasibility. Meanwhile, the number of respondents who took part in the survey was small and the quantitative data analysis did not achieve the statistical normal distribution required to execute a lot of inferential tests. Hence, most of the results from the quantitative data analysis in this study depended on the descriptive tests as well as some inferential non-parametric tests.

In the meantime, this study focused on the aspect of utilisation of the VLE platform in teaching and learning. Although this study presented some evidences of the platform being utilised for the teachers' administrative tasks, in-depth discussions included in this study only evolved around the scope of this research, mainly involving tasks that were particularly associated with teaching and learning, including the teachers' involvement in the development of learning sites. Hence, despite being able to answer the research questions posed in this study, the findings were insufficient in providing extensive data for in-depth discussions regarding the other functions of the VLE platform.

There were also some limitations in the process of conducting this study. As highlighted earlier, it was mandatory for the researcher to go through a standard

procedure involving layers of bureaucratic applications. Hence, the timeline prepared for this study had to be adjusted several times based on clearance from authorities at each level. For example, application letter to conduct the study in the potential post-primary national schools in Selangor could ony be submitted to the State Education Department after gaining the approval letter from the EPU. Similarly, applications to the potential schools must include attachment of the approval letter from the Selangor State Education Department. During the data collection process, the researcher was bound to the schedules fixed by the case study schools and participants during the data collection. Appointments for data collection were set based on school term calendar in Malaysia as well as the participants' professional (work) schedules. Some appointments had to be rescheduled to suit unanticipated meetings or activities involving the participants. Hence, the reschedules affected the timeline planned for the study.

6.5 RECOMMENDATIONS FOR FUTURE RESEARCH

This study investigated the extent and impact of the VLE utilisation amongst teachers in post-primary national schools in Malaysia. Due to the large number of schools in the country, this study was conducted using the multiple-case study method involving only one particular state in Malaysia. Extending the scope to include more schools in the other states in Malaysia (involving different types of schools and geographical locations) would provide insights regarding the issues encountered elsewhere in the country. Hence, the future results can assist a better understanding regarding the utilisation of the VLE platform for the benefit of the school administrators, policymakers and other relevant stakeholders. Similarly, involving schools with low, moderate and high levels of the VLE

utilisations would also provide a more robust yet intricate data for future reference.

In addition, at the time this final chapter was written, the Malaysian MoE has just begun implementing its own digital learning platform to replace Frog VLE. Thus, this study can be used as reference to conduct a similar investigation to determine the extent of utilisation of the new VLE platform. Future research should further explore the types of support at individual teacher and whole school levels that are deemed useful in encouraging more utilisations of the VLE platform and teacher participations in digital content creations. Other potential areas of investigations include the roles of school leadership and professional learning community in enhancing the digital transformation in teaching and learning as well as promoting schools as learning organisations.

Apart from that, the findings from this study has provided a foundation for further investigation regarding how the Teacher ICT Integration model could best be applied in other countries practising the context of the hierarchical leadership culture. Future research would yield further evidence and findings that would help to enhance the usefulness and applicability of the current model.

6.6 CONCLUSION

The purpose of this study was to gain an in-depth understanding of the perspectives regarding the utilisation of a VLE platform by teachers in the Malaysian post-primary national school context. An investigation via a multiple-case study approach incorporating quantitative and qualitative data collections provided the necessary findings to address the research questions for this study,

as elaborated and discussed in this thesis. For example, this study has addressed the questions regarding the extent of VLE utilisation in teaching and learning as well as significant factors contributing to teachers' integration of the learning platform for pedagogical purpose. Furthermore, the study has suggested the impacts from the VLE utilisation on the teachers' professional practice and teacher-student relationship.

Findings from this study also helped to identify the types of teachers according to the categories in the Teacher ICT Integration model. In addition, the findings helped to understand the relevance of the model in the context of a hierarchical leadership culture practised in Malaysia. Findings from this study provided a more comprehensive understanding regarding the teachers' utilisation of a learning platform particularly for teaching and learning purposes, compared to previous studies especially in the Malaysian context. Hence, the findings illustrate potential practical and theoretical implications deemed essential for future decisions as well as academic discussions associated with the implementation of a VLE platform not only in Malaysia but also in other countries.

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Examining Virtual Learning Environment (VLE): Utilisation Factors and Impact on National School Teachers in Malaysia.

*Note/Nota: This questionnaire contains statements and questions in English and Malay Language. For Section 1, the translation in Malay Language is available towards the end, just before the the 'Consent / Kebenaran" declaration. / Soal selidik ini mengandungi kenyataan-kenyataan dan soalan-soalan dalam Bahasa Inggeris dan Bahasa Melayu. Terjemahan dalam Bahasa Melayu untuk Seksyen 1 terdapat di bahagian akhir, sebelum deklarasi 'Consent / Kebenaran'.

Section 1: Background and Consent

Researcher:
Name: Ruzana binti Tukimin, School of Education, Trinity College Dublin
Contact: tukiminr@tcd.ie / Telephone (Malaysia): 019-3571102

Research Supervisor:
Name: Dr. Keith Johnston, School of Education, Trinity College Dublin
Contact: kjohnsto@tcd.ie

Dear Participant,

I am currently undertaking a research project as part of my PhD study, under the supervision of Dr. Keith Johnston at the School of Education, Trinity College Dublin, The University of Dublin, Ireland. The research focuses on investigating Malaysian secondary (will be referred to as post-primary throughout this survey) school teachers' utilisation of the Virtual Learning Environment (VLE) initiative. The objectives of this study are to identify significant factors influencing teachers' use of VLE, exploring the impact of VLE implementation on teachers' professional practice as well as on teacher-student relationship. Consequently, this study also aims to suggest measures to improve the utilisation of VLE among post-primary school teachers in Malaysia. As a school teacher, you are invited to participate through this questionnaire.

What is involved if you participate in this study?
This survey consists of fifty seven (57) questions, including 12 items in Consent and Demographic sections. It will take approximately between fifteen to twenty five (15 - 25) minutes to complete. The questions require you to select your answers from the options related to your experience utilising the VLE platform. The term "utilising", "utilise" or "utilisation" in this study refer to your involvement, participation, commitment and time spent in using the VLE platform for various purposes including to search for teaching and learning resources, developing learning sites, as part of the teaching and learning process with the students, to assign and receive homework from students or as a communication platform with other teachers and the students' parents. Based on the current implementation endorsed by the Ministry of Education (MOE) Malaysia, the platform refers to the Frog VLE.

How will the research findings be used?
Data collected within this study will be published as a thesis for a Doctor of Philosophy qualification at Trinity College Dublin, The University of Dublin, Ireland. The research findings may be used in further studies, conference presentations, and publications on ICT in education for post-primary school communities, in particular related to the integration of a VLE initiative. The final result of this study may also be used by the MOE Malaysia to improve specifically the utilisation of VLE in Malaysian schools in an effort to scale up quality learning, as specified in the Malaysia Education Blueprint 2013-2025 (Pre-School to Post-Secondary Education).

Management of Data
Data referred to in this study are all instruments (questionnaire, interview & focus group questions, & observation checklist), voice-recording files, interview transcribes, consent forms and other research documents. All data will be stored in a password locked computer and will not be left unattended on the computer screen. Data collected will only be available to the researcher and supervisor. Upon completion of this study and subsequent publications, all data collected will

be appropriately destroyed.

Anonymity and Confidentiality
The response you provide during this study will remain anonymous in the representation of data throughout the collection process, within the thesis and research dissemination. To ensure anonymity throughout the study, teachers will be represented with a Teacher Identifier (i.e. Teacher One = TCHR 1). All data will only be used for this study and related output such as conference, journals, etc.

Risks and Right To Refuse or Withdraw
This study does not involve any type of physical risk. At any time throughout this research, you may withdraw your consent without providing reason for withdrawal. If you request to withdraw there will be zero repercussions, either personally or professionally, and all your data will be immediately extracted and deleted appropriately by the researcher.

Right to Ask Questions
You have the right to ask questions about this study and to have those questions answered by the researcher before, during or after the research.

**Please scroll down to proceed to 'Consent / Kebenaran' after the following translation.

Translation in Malay Language / Terjemahan dalam Bahasa Melayu:

Seksyen 1: Latar belakang dan Kebenaran

Penyelidik:
Nama: Ruzana binti Tukimin, School of Education, Trinity College Dublin
Emel: tukiminr@tcd.ie / Telefon (Malaysia): 019-3571102

Penyelia Kajian:
Nama: Dr. Keith Johnston, School of Education, Trinity College Dublin
Emel: kjohnsto@tcd.ie

Tuan/Puan,

Saya sedang melaksanakan sebuah kajian sebagai memenuhi keperluan pengajian peringkat PhD, di bawah penyeliaan Dr. Keith Johnston di School of Education, Trinity College Dublin, The University of Dublin, Ireland. Kajian ini memberi fokus terhadap penggunaan persekitaran pembelajaran maya / virtual learning environment (VLE) dalam kalangan guru-guru di sekolah menengah di Malaysia. Kajian ini bertujuan mengenalpasti faktor-faktor utama yang mempengaruhi guru-guru untuk menggunakan VLE, mengkaji impak pelaksanaan VLE terhadap amalan profesionalisme guru-guru, serta impak terhadap hubungan guru-murid. Kajian ini juga bertujuan mengenalpasti langkah-langkah untuk menambahbaik penggunaan VLE dalam kalangan guru-guru sekolah menengah di Malaysia. Sebagai seorang guru, tuan/puan dijemput untuk mengambil bahagian dalam soal selidik ini.

Apakah yang tuan/puan akan lalui sekiranya menyertai kajian ini?
Soal selidik ini mengandungi lima puluh tujuh (57) soalan, termasuk 12 item di bahagian Kebenaran dan Demografi. Soal selidik ini mangambil masa kira-kira lima belas hingga dua puluh lima (15 - 25) minit untuk dilengkapkan. Tuan/puan diminta untuk memilih jawapan berdasarkan pilihan-pilihan yang disediakan berkaitan pengalaman tuan/puan dalam menggunakan inisiatif VLE. Perkataan "menggunakan" dan "penggunaan" di dalam kajan ini merujuk kepada penglibatan, komitmen dan masa yang diluangkan oleh tuan/puan dalam menggunakan inisiatif VLE untuk pelbagai tujuan termasuk mencari bahan sumber pengajaran dan pembelajaran (PdP), membina laman pembelajaran, sebagai sebahagian daripada proses PdP bersama murid-murid, untuk memberi kepada dan menerima tugasan daripada murid-murid, atau sebagai platform komunikasi bersama guru-guru lain serta ibu bapa kepada murid-murid. Berdasarkan kepada pelaksanaan yang sedang berkuatkuasa dan diperakukan oleh pihak Kementerian Pendidikan Malaysia (KPM), platform VLE pada masa kini merujuk kepada Frog VLE.

Bagaimanakah Hasil Kajian Ini Akan Digunakan?
Respon yang dikumpul menerusi kajian ini akan diterbitkan sebagai sebuah tesis untuk kelayakan Doktor Falsafah di Trinity College Dublin, The University of Dublin, Ireland. Dapatan daripada kajian ini mungkin akan digunakan untuk kajian lanjutan, pembentangan dalam mana-mana persidangan pendidikan, dan penerbitan berkaitan teknologi pendidikan, khususnya mengenai pengintegrasian VLE. Dapatan akhir daripada kajian ini mungkin juga akan digunakan oleh pihak

KPM untuk menambah baik penggunaan VLE di sekolah-sekolah di Malaysia, dalam usaha untuk meningkatkan kualiti pembelajaran seperti yang dihasratkan menerusi Pelan Pembangunan Pendidikan Malaysia 2013-2025 (Pendidikan Pra- Sekolah hingga Lepas Menengah).

Pengurusan Data
Data yang dimaksudkan dalam kajian ini merujuk kepada semua instrumen (soal selidik, soalan temu bual dan focus group, serta senarai semak pemantauan kelas), fail rakaman suara, transkrip temu bual, borang kebenaran and dokumen lain yang berkaitan. Semua data akan disimpan di dalam komputer yang mempunyai kata laluan dan paparan skrin tidak akan dibiarkan tanpa penyeliaan. Data yang dikumpul hanya akan diakses oleh penyelidik dan penyelia. Semua data akan dihapuskan mengikut kaedah bersesuaian setelah tamat pengajian dan penerbitan berkaitan.

Tahap Kerahsiaan Dan Tanpa Nama (Anonymity)
Data yang diberikan oleh tuan/puan akan kekal tanpa nama (anonymous) dan rahsia sepanjang proses pengumpulan data, dalam penulisan tesis dan penyebaran hasil kajian. Rujukan kepada tuan/puan akan melibatkan kod (cth: Guru Satu = G1). Semua data akan hanya digunakan untuk tujuan kajian ini dan output yang berkaitan seperti persidangan, penulisan jurnal, dan sebagainya.

Risiko dan Hak Untuk Menolak Atau Menarik Diri
Kajian ini tidak melibatkan sebarang risiko fizikal. Tuan/puan boleh menarik semula kebenaran atau menarik diri daripada menyertai kajian ini pada bila-bila masa, tanpa perlu memberikan sebarang alasan. Sekiranya tuan/puan menarik diri, tidak akan ada sebarang implikasi sama ada secara peribadi atau profesional, dan semua data tuan/puan akan dikeluarkan dan dimusnahkan dengan cara sesuai oleh penyelidik.

Hak Untuk Bertanya Soalan
Tuan/puan mempunyai hak untuk bertanya soalan mengenai kajian ini dan soalan tersebut perlu dijawab oleh penyelidik sama ada sebelum, semasa atau selepas kajian dijalankan.

*Required

Consent / Kebenaran

Please answer ALL of the following statements by clicking at the appropriate boxes. / Sila klik di ruangan yang bersesuaian untuk memberi respon kepada SEMUA kenyataan-kenyataan berikut.

1. **I have read and understood what this project is about. / Saya telah membaca dan memahami latar belakang kajian ini.** *
   Mark only one oval.
   - ◯ Yes / Ya
   - ◯ No / Tidak

2. **I have read and understood what the results of this study will be used for. / Saya telah membaca dan memahami tujuan kegunaan hasil kajian ini.** *
   Mark only one oval.
   - ◯ Yes / Ya
   - ◯ No / Tidak

3. **I know that my participation is voluntary and that I can withdraw from the project at any stage without giving any reason. / Saya mengetahui bahawa penyertaan saya adalah secara sukarela dan saya boleh menarik diri daripada projek ini tanpa memberikan sebarang alasan.** *
   Mark only one oval.

   - ◯ Yes / Ya
   - ◯ No / Tidak

4. **I am aware that my responses will be kept confidential and no individual will be identified in the reporting of the study. / Saya sedar bahawa tahap kerahsiaan respon yang saya berikan akan dijaga dan tiada individu dinamakan dalam laporan kajian.** *
   Mark only one oval.

   - ◯ Yes / Ya
   - ◯ No / Tidak

5. **Confirm / Pengesahan** *
   Mark only one oval.

   - ◯ Yes I would like to participate in this survey (Thank you, please click 'Next' to proceed) / Ya saya ingin menyertai soal selidik ini (Term kasih, sila klik 'Next')
   - ◯ No I would not like to participate (Thank you, please close this survey to exit) / Tidak, saya tidak mahu terlibat (Terima kasih, sila tutup halaman ini untuk keluar dari soal selidik)

Demographic Information / Maklumat Demografi

Please click at the appropriate boxes or fill in the blanks with relevant answers. / Sila klik di petak yang berkaitan atau lengkapkan ruang kosong dengan jawapan yang sesuai.

6. **Please indicate the type(s) of school you are currently teaching (you may click in more than one box) / Sila nyatakan jenis sekolah tempat anda mengajar sekarang (boleh klik lebih daripada satu petak)**
   Tick all that apply.

   - ☐ Sekolah Menengah Kebangsaan/Sekolah Menengah (SMK/SM)
   - ☐ Sekolah Menengah Agama (SMA)
   - ☐ Sekolah Sukan
   - ☐ Sekolah Seni
   - ☐ Sekolah Berasrama Penuh
   - ☐ Sekolah Kluster Kecemerlangan
   - ☐ Sekolah Berprestasi Tinggi
   - ☐ Sekolah Bestari
   - ☐ Other:

7. **Your Age / Umur Anda** *

   _____

8. **Gender / Jantina**
   Mark only one oval.

   - ◯ Male / Lelaki
   - ◯ Female / Perempuan

9. **Years of Teaching Experience / Bilangan Tahun Mengajar** *

   _____

10. **Experience in Using Frog VLE (in months: i.e. 1 month/12 months) / Pengalaman Menggunakan Frog VLE (dalam bulan: cth: 1 bulan / 12 bulan)** *

    _____

11. **Please state the subject(s) you are currently teaching. / Sila nyatakan mata pelajaran yang sedang diajar (boleh lebih daripada satu)**
    Tick all that apply.

    - ☐ Malay Language / Bahasa Melayu
    - ☐ English Language / Bahasa Inggeris
    - ☐ Mathematics / Matematik
    - ☐ Science / Sains
    - ☐ History / Sejarah
    - ☐ Geography / Geografi
    - ☐ Islamic Studies / Pengetahuan Agama Islam
    - ☐ Moral Education / Pendidikan Moral
    - ☐ Other:

12. **Please indicate the Level (s) / Form(s) you are currently teaching. / Sila nyatakan tahap / tingkatan yang sedang diajar (jawapan boleh melebihi satu)**
    Tick all that apply.

    - ☐ Form 1
    - ☐ Form 2
    - ☐ Form 3
    - ☐ Form 4
    - ☐ Form 5
    - ☐ Form 6
    - ☐ Primary School / Sekolah Rendah
    - ☐ Other:

Actual Utilisation of Frog VLE / Penggunaan Sebenar Frog VLE

Questions (a) to (g): With reference to any one (1) class that you teach, state the frequency or choose one (1) answer for each question.

Soalan (a) hingga (g): Berdasarkan mana-mana satu (1) kelas yang tuan/puan ajar, nyatakan kekerapan atau pilih satu (1) jawapan untuk setiap soalan.

13. **(a). Please indicate the approximate number of times (per month) in which integration of Frog VLE occurs as part of teaching and learning with the students / Sila nyatakan anggaran jumlah (dalam sebulan) pengintegrasian Frog VLE dilaksanakan sebagai sebahagian sesi PdP bersama murid-murid (Example / Contoh: 0 = never / tidak pernah; 1= once a month / sekali sebulan; 5 = 5 times per month / 5 kali sebulan).**

_____

14. **(b). I assign homework to students via Frog VLE. / Saya menggunakan Frog VLE untuk menghantar tugasan kepada murid-murid.**

Mark only one oval.

- ◯ Never / Tidak Pernah
- ◯ Once a week / Satu kali dalam seminggu
- ◯ Once a month / Satu kali dalam sebulan
- ◯ More than once a week / Lebih daripada satu kali dalam seminggu

15. **(c). My students use Frog VLE to send their homework to me. / Murid-murid menggunakan Frog VLE untuk menghantar tugasan kepada saya.**

Mark only one oval.

- ◯ Never / Tidak Pernah
- ◯ Rarely / Jarang-jarang
- ◯ Sometimes / Kadang-kadang
- ◯ Often / Kerap
- ◯ Always / Sangat kerap

16. **(d). I utilise Frog VLE to give feedback to my students regarding their homework or assignments. / Saya menggunakan Frog VLE untuk memberikan maklum balas kepada murid-murid berkaitan tugasan mereka.**

Mark only one oval.

- ◯ Never / Tidak Pernah
- ◯ Once a week / Satu kali dalam seminggu
- ◯ Once a month / Satu kali dalam satu bulan
- ◯ More than once a week / Lebih daripada satu kali dalam seminggu

17. **(e). Communication with my students via Frog VLE (i.e. forums, assign and receive homework, etc.) also occurs outside school hours. / Komunikasi dengan murid-murid menerusi Frog VLE (cth. forum, menghantar dan menerima tugasan, dll.) turret melibatkan luar waktu persekolahan.**
Mark only one oval.

- Never / Tidak pernah
- Rarely / Jarang-jarang
- Sometimes / Kadang-kadang
- Often / Kerap
- Always / Sangat Kerap

18. **(f). I utilise Frog VLE to communicate with the students' parents. / Saya menggunakan Frog VLE untuk berkomunikasi bersama ibu bapa kepada murid-murid.**
Mark only one oval.

- Never / Tidak Pernah
- Once a week / Satu kali dalam seminggu
- Once a month / Satu kali dalam sebulan
- More than once a week / Lebih daripada satu kali dalam seminggu

19. **(g). I integrate Frog VLE in teaching and learning mainly to... / Saya mengintegrasikan Frog VLE dalam PdP khususnya untuk...**
Mark only one oval.

- provide students with additional resources to enhance their understanding of the topic / memberikan murid-murid bahan rujukan tambahan bagi meningkatkan pemahaman terhadap topik
- provide students with additional resources to enhance their comprehension and test their understanding of the topic /memberikan murid-murid bahan rujukan tambahan bagi meningkatkan serta menguji pemahaman terhadap topik
- provide opportunity for students to further explore the topic and express their opinions via discussions and debates with their peers and teachers / memberikan peluang kepada murid-murid untuk terus meneroka tajuk dan mengemukakan pendapat masing-masing menerusi perbincangan dan debat bersama rakan sebaya serta guru
- provide opportunity for students to further explore the topic, collaborate in groups to experiment or practice the knowledge as well as discover and present new ideas and findings / memberikan peluang kepada murid-murid untuk terus meneroka tajuk, berkolaborasi dalam kumpulan untuk melaksanakan eksperimen atau latihan berkaitan pengetahuan yang dipelajari serta menemui dan membentangkan hasil dan idea-idea baharu.

Frog VLE Integration, Teachers' Beliefs and Reflection

Please click at the appropriate scale/option that best reflect your answers to the statements. / Sila klik pada skala/pilihan yang paling menggambarkan jawapan anda terhadap kenyataan yang diberikan.
1 = Strongly disagree / Sangat tidak setuju
2 = Disagree / Tidak setuju
3 = Not sure / Tidak pasti
4 = Agree / Setuju
5 = Strongly agree / Sangat setuju

20. **I am satisfied with my current teaching style and have no intention to utilise Frog VLE in teaching and learning / Saya berpuashati dengan kaedah pengajaran saya sekarang dan tidak berhasrat untuk menggunakan Frog VLE dalam PdP.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat setuju

21. **I integrate Frog VLE in teaching and learning whenever I find useful resources that will help my students to improve their academic grades. / Saya mengintegrasikan Frog VLE dalam PdP apabila menjumpai bahan sumber pendidikan yang dapat membantu murid-murid saya meningkatkan pencapaian gred akademik mereka.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

22. **I utilise Frog VLE to diversify my pedagogical approaches. / Saya menggunakan Frog VLE untuk mempelbagaikan kaedah pedagogi.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

23. **I use Frog VLE because other teachers are using it. / Saya menggunakan Frog VLE kerana guru-guru lain menggunakannya.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

24. **I use Frog VLE to adhere to instructions from the administrator/higher authority. / Saya menggunakan Frog VLE kerana mematuhi arahan pentadbir/pihak atasan.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

25. **I utilise Frog VLE because I often find quality teaching and learning resources. / Saya menggunakan Frog VLE kerana seringkali menjumpai bahan-bahan sumber PdP yang berkualiti.**

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

26. **I consider myself at the following skill level in terms of utilising Frog VLE / Saya menganggap diri saya berada pada tahap kemahiran berikut dalam menggunakan Frog VLE**

Mark only one oval.

- ◯ No skill at all / Tiada kemahiran
- ◯ Low level / Tahap rendah
- ◯ Intermediate level / Tahap sederhana
- ◯ Advanced level / Tahap mahir

27. **I am more motivated to utilise Frog VLE for teaching and learning if there is encouragement from the school administrator /Saya lebih bermotivasi untuk menggunakan Frog VLE sekiranya mendapat galakan daripada pihak pentadbir sekolah.**

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

28. **I am more motivated to utilise Frog VLE for teaching and learning after I have seen evidence of positive outcomes from using it /Saya lebih bermotivasi untuk menggunakan Frog VLE setelah melihat bukti positif hasil penggunaannya.**

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

29. **I realise that interactions and communications between my students and I have increased since I started utilising Frog VLE with them. / Saya mendapati bahawa interaksi dan komunikasi antara saya dan murid-murid telah meningkat sejak saya menggunakan Frog VLE dengan mereka.**

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

30. **I realise that when integrating Frog VLE in teaching and learning, I become a facilitator to my students. / Saya mendapati bahawa ketika mengintegrasikan Frog VLE dalam PdP, saya menjadi seorang fasilitator kepada murid-murid.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

31. **I realise that since utilising Frog VLE, I have changed my teaching approach to be more student-centred. / Saya mendapati bahawa sejak menggunakan Frog VLE, saya telah mengubah pendekatan PdP saya kepada lebih berasaskan murid.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

32. **I realise that since utilising Frog VLE, my students are able to demonstrate independent learning. / Saya mendapati bahawa sejak menggunakan Frog VLE, murid-murid saya dapat menunjukkan pembelajaran kendiri.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

Development of Learning Sites / Pembangunan Laman Pembelajaran

Please click at the appropriate column that best reflect your answers to the statements. / Sila klik pada ruangan yang paling menggambarkan jawapan anda terhadap kenyataan yang diberikan.

33. **I have developed the following number of learning sites in Frog VLE. / Saya telah membina laman pembelajaran berjumlah seperti berikut.**
Mark only one oval.

- ◯ 0
- ◯ Between 1 to 10 / Antara 1 hingga 10
- ◯ More than 10 / Lebih daripada 10

34. **I consider myself at the following skill level in terms of developing learning sites. / Saya menganggap diri saya berada pada tahap kemahiran berikut dalam membina laman pembelajaran.**
Mark only one oval.

- ◯ No skill at all / Tiada kemahiran
- ◯ Low level / Tahap rendah
- ◯ Intermediate level / Tahap sederhana
- ◯ Advanced level / Tahap mahir

35. **I use the following widgets in Frog VLE / Saya menggunakan widget-widget yang terdapat dalam Frog VLE seperti berikut:**
Mark only one oval per row.

	0 (Never / Tidak Pernah)	1 (Rarely / Jarang-jarang)	2 (Sometimes / Kadang-kadang)	3 (Often / Kerap)	4 (Always / Sangat Kerap)
App Link	◯	◯	◯	◯	◯
Calendar	◯	◯	◯	◯	◯
e-Bahan	◯	◯	◯	◯	◯
Embed Website	◯	◯	◯	◯	◯
External Link	◯	◯	◯	◯	◯
File Drop	◯	◯	◯	◯	◯
Forum	◯	◯	◯	◯	◯
Link to File	◯	◯	◯	◯	◯
Media	◯	◯	◯	◯	◯
The Pond	◯	◯	◯	◯	◯

36. **Other Widgets (Please state the name and frequency) / Widget-widget lain (Sila nyatakan nama widget dan kekerapan)**

37. **I develop learning sites in Frog VLE because of the following reasons (you may click more than 1 answer) / Saya membina laman pembelajaran dalam Frog VLE kerana sebab-sebab berikut (boleh klik lebih daripada satu pilihan jawapan)**
Tick all that apply.

- ☐ Not applicable, I have never developed any learning sites / Tidak berkaitan, saya tidak pernah membina sebarang laman pembelajaran
- ☐ To diversify my teaching and learning approaches / Untuk mempelbagaikan kaedah PdP
- ☐ For my own future teaching reference / Untuk rujukan PdP saya pada masa akan datang
- ☐ To share my lesson plans/activities with other teachers / Untuk berkongsi rancangan/aktiviti PdP saya
- ☐ For my students' independent learning / Untuk pembelajaran kendiri murid-murid saya
- ☐ To help me achieve my lesson objectives / Untuk membantu saya mencapai objektif pembelajaran
- ☐ Other: _____

38. **I am more motivated to develop learning sites in Frog VLE if there is encouragement from the school administrators . / Saya lebih bermotivasi untuk membina laman pembelajaran di dalam Frog VLE sekiranya mendapat galakan daripada pihak pentadbir sekolah.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

39. **Developing learning sites in Frog VLE is NOT an extra workload. / Membina laman pembelajaran di dalam Frog VLE BUKAN satu beban kerja tambahan.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

40. **Since I have started developing learning sites, I realise that I often integrate Frog VLE in my current teaching and learning compared to previously / Sejak membina laman pembelajaran, saya lebih kerap mengintegrasikan Frog VLE dalam PdP sekarang berbanding kaedah PdP saya yang dahulu.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

41. **Teachers are the best people to develop educational resources and learning sites in Frog VLE because of their knowledge in subject content and pedagogy. / Bahan sumber PdP dan laman pembelajaran dalam Frog VLE adalah paling baik dibangunkan oleh guru-guru kerana mereka mempunyai pengetahuan mengenai pedagogi dan isi kandungan mata pelajaran**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

Frog VLE Training and Teachers' Professional Development / Latihan Frog VLE dan Peningkatan Profesionalisme Guru

Please click at the appropriate scale that best reflect your answers to the statements. / Sila klik pada skala yang paling menggambarkan jawapan anda terhadap kenyataan yang diberikan.
1 = Strongly disagree / Sangat tidak setuju
2 = Disagree / Tidak setuju
3 = Not sure / Tidak pasti
4 = Agree / Setuju
5 = Strongly agree / Sangat setuju

42. **I have received adequate training or professional development sessions on how to integrate Frog VLE for teaching and learning. / Saya telah menerima latihan yang mencukupi mengenai cara mengintegrasi Frog VLE dalam PdP.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

43. **I have received adequate training or professional development sessions on how to develop learning sites for Frog VLE. / Saya telah menerima latihan yang mencukupi mengenai cara membina laman pembelajaran untuk Frog VLE.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

44. **The training or professional development sessions I have received enabled me to confidently utilise Frog VLE. / Latihan yang telah saya terima membolehkan saya menggunakan Frog VLE dengan yakin.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

45. **I utilise Frog VLE to create teaching and learning collaborations with other teachers in my school. / Saya menggunakan Frog VLE untuk melaksanakan kolaborasi berkaitan PdP dengan guru-guru di sekolah saya.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

46. **I utilise Frog VLE to create teaching and learning collaborations with teachers from other schools. / Saya menggunakan Frog VLE untuk melaksanakan kolaborasi berkaitan PdP dengan guru-guru di sekolah lain.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongy Agree / Sangat Setuju

Challenges/Barriers To Frog VLE Integration / Cabaran/Halangan Kepada Pengintegrasian VLE

Please click at the appropriate scale that best reflect your answers to the statements. / Sila klik pada skala yang paling menggambarkan jawapan anda terhadap kenyataan yang diberikan.
1 = Strongly disagree / Sangat tidak setuju
2 = Disagree / Tidak setuju
3 = Not sure / Tidak pasti
4 = Agree / Setuju
5 = Strongly agree / Sangat setuju

47. **The number of functioning ICT equipment in the school is adequate to implement teaching and learning that integrates Frog VLE. / Bilangan peralatan ICT yang berfungsi di sekolah adalah mencukupi untuk melaksanakan integrasi Frog VLE dalam PdP.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

48. **Majority of my students have suitable ICT equipment and internet connectivity to access Frog VLE outside the school. / Majoriti murid-murid saya mempunyai peralatan ICT yang sesuai serta internet untuk mengakses Frog VLE di luar sekolah.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

49. **The internet connectivity available in the school enables good access to Frog VLE. / Capaian internet yang ada di sekolah membolehkan Frog VLE diakses dengan baik.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

50. **I am able to allocate enough time to prepare for a lesson that integrates Frog VLE. / Saya dapat membahagikan cukup masa untuk menyediakan satu PdP yang mengintegrasikan Frog VLE.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

51. **I have adequate time to implement a lesson that integrates Frog VLE in the classroom. / Saya mempunyai waktu yang mencukupi untuk melaksanakan PdP yang mengintegrasikan Frog VLE di dalam kelas.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

52. **I do get technical assistance whenever needed. / Saya mendapat bantuan teknikal apabila diperlukan.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

53. **Frog VLE can be used to support the curriculum and subject syllabus. / Frog VLE dapat digunakan untuk menyokong kurikulum dan sukatan mata pelajaran.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

54. **Frog VLE can be used to support students' preparations for assessments or examinations. / Frog VLE boleh digunakan untuk menyokong persediaan murid-murid bagi menghadapi pentaksiran or peperiksaan.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

55. **Frog VLE can be utilised to develop useful skills for students to use in their daily life and in future. / Frog VLE boleh digunakan untuk membina kemahiran yang berguna bagi murid-murid dalam kehidupan seharian dan masa depan mereka.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Sangat Tidak Setuju	◯	◯	◯	◯	◯	Strongly Agree / Sangat Setuju

56. **Thank you for taking the time to complete this questionnaire. If there are any additional comments you wish to make, please use the space provided here. / Terima kasih kerana meluangkan masa untuk melengkapkan soal selidik ini. Sekiranya anda berhasrat untuk menambah sebarang komen, sila gunakan ruangan berikut.**

APPENDIX 2

TEACHER INTERVIEW QUESTIONS *Guideline only (English version)

1. On a typical day, how do you incorporate Frog VLE into your teaching? Was the class I observed typical of your use?
   - How well does Frog VLE fit into your subject area?
   - How frequently do you use Frog VLE? For what purposes e.g. explanation of topic, communicating, providing exercise & test questions, marking homework, to initiate discussions & group collaborations?
   - Does your integration of Frog VLE for teaching and learning with the students typically occur during the formal lessons/school hours or outside school hours? Why is this so?
   - Do you integrate Frog VLE differently with different classes? What factors do you take into consideration? (i.e. depending on age or ability? Students' familiarity with Frog VLE? Depending on topics? Exam classes vs non-exam classes? Students' access to Frog VLE outside school).

2. Tell me about what you think the benefits are for students in using Frog VLE for teaching and learning?
   - Have you observed any positive changes in your students (attitude, learning behaviour, performance, etc) since using Frog VLE?
   - Do you think that using Frog VLE will help students to improve their academic grades?
   - In your opinion which is more important, preparing students to excel in their assesments/examinations or helping them to develop their 21st century and higher order thinking skills? Why do you think so?
   - Do your students ever communicate with you via Frog VLE (e.g. asking questions in forums, sending homework etc) outside school hours? If so, do you respond or give feedback to them outside school hours as well? Why/why not?
   - Any drawbacks?

3. Tell me about what you think the benefits are for you (the teacher) in using Frog VLE for teaching and learning?
   - Has it enabled change/enhancement to your practice in terms of preparation? Lesson presentation/delivery? Teaching approach/role of teacher (e.g. more student centered/teacher as facilitator)? Communication with other teachers/school management/students/parents? Assessment strategies?

4. What do you think are the main factors that impede or promote a teacher's use of Frog VLE in their teaching and learning?
   - For you, what are the key factors that promote your use of Frog VLE in teaching and learning?
   - Did you wait till you see positive outcomes before you actually decided to use Frog VLE? (evidence either from your own experience or from observation of others). If yes, what positive outcomes/evidence did you see that made you decided to use Frog VLE?
   - For you, what are the key factors that impede your use of Frog VLE in teaching and learning?

5. Tell me about any Frog VLE related CPD that you have experienced?
   - How often are you exposed to Frog VLE related CPD? Are they organised by your school/state education dept/MOE division?
   - What made the CPD helpful/unhelpful? Did you make changes in your teaching/professional practice as a result? Did any such changes have a knock on impact on the student experience e.g. student involvement/learning/motivation/behaviour?
   - Has school management promoted the facilitation of colleagues collaborating with each other to promote Frog VLE integration? Has there been any school/peer-based CPD? What approach to CPD would you suggest as being most useful for the future?

6. Could you describe for me some challenges/difficulties you have come across in relation to Frog VLE use/integration in your teaching? How did you overcome these difficulties?
   - E.g. time factor (both before class in preparation and in class time),
   - compatibility with State/national level examinations,
   - expectations from self/colleagues/school management/students/parents,
   - technological issues?

7. Tell me about your experience developing and sharing learning sites in Frog VLE.
   - Are you a regular contributor? Why/why not?
   - How do you find the experience in developing the learning sites? (easy/difficult)? What makes it easy/difficult?
   - If you have experience developing learning sites, do you share them with others? Does the sharing only involve your colleagues in your school, or do you also share them in the MOE repository (open access for other teachers nationwide)? Why/why not?
   - If you have experience developing learning sites, do you find yourself integrating Frog VLE in teaching and learning more often than before you started developing learning sites? Why do you think so?
   - What is your opinion on requesting teachers to develop learning sites? Additional workload for the teachers?
   - If teachers do not develop learning sites (or other educational resources that may be shared in Frog VLE), what is your recommendation so that there will constantly be up-to-date resources to be used by teachers and students?

8. Tell me about whether you feel as a school, Frog VLE is embedded into the day to day teaching and learning.
   - Has this school made efforts to help support use of Frog VLE? How has this been done? Was it helpful/beneficial? What additional supports would you see as useful?
   - Where would you see this school standing when compared with other schools in relation to their promotion and use of Frog VLE for teaching and learning?
   - What school based factors have contributed to the schools current Frog VLE use?

Thank you for your kind co-operation in taking part in this interview session.

APPENDIX 3

SCHOOL ADMINISTRATOR INTERVIEW QUESTIONS *Guideline (English version)

1. Please tell me some background information regarding this school (e.g. type of school, number of students, number of teachers, acknowledgements/achievements (if any), general description of ICT infra in the school, school culture with regard to ICT/Frog VLE use.

2. As a school administrator, what is your opinion on the MOE's Frog VLE initiative?
   - How beneficial / unbeneficial is it for teachers and students in your school?

3. Do you encourage your teachers to integrate Frog VLE for teaching and learning? If yes, please elaborate why & how? If no, please indicate reasons.
   - Does your school organize specific activities / programmes to encourage the school community to utilise Frog VLE? If yes, please elaborate. If no, do you have any plans to organize specific activities to promote Frog VLE integration? Why/why not?
   - Are there changes in the teachers' teaching approach / pedagogy since Frog VLE has been made accessible to this school community? How & what factors do you think contribute to these changes / no change?
   - What about the students, are there changes (i.e. their attitude, skills, learning styles etc) that may be attributed to Frog VLE?
   - How do you see the relevance of integrating VLE in teaching and learning, with the current curriculum and assessment?

4. What are some of the challenges or difficulties you face when trying to ensure the utilisation of Frog VLE?
   - Is the current infrastructure adequate & relevant? What about teachers' knowledge & integration skills? Is there any budget issue? What about time factor & workload? Technical support?
   - Are there positive responses from the teachers? Yes/No? Why do you think teachers react this way?
   - What is your opinion on teachers' belief with regard to Frog VLE integration for teaching and learning? Do you feel that the majority of your teachers believe Frog VLE is beneficial for them & the students?
   - How would you change the teachers' belief (e.g. from non-user to voluntary user of Frog VLE)?

5. In relation to Frog VLE integration, where do you see most of your teachers if I were to give the following 4 categories:
   a) Creative adapter (i.e. using it to promote student-centred learning, for 21st century skills, diversify pedagogy)
   b) Selective adopter (i.e. using it mainly to help students excel in exams, mainly still teacher-centered)
   c) Inadvertent user (i.e. using it because of instruction/peer pressure)
   d) Contented traditionalist (i.e. non-user)

6. What do you think of the MOE's encouragement for teachers to develop learning sites and share them in the Frog VLE repository?
   - Do you think it is something positive for the teachers? Please elaborate.
   - To what extent do teachers in your school involve themselves in the development and sharing of learning sites in Frog VLE?
   - Could you please describe if there are there collaborations among teachers involving Frog VLE?

7. Do you have any suggestions on what other school administrators or the MOE should do to encourage more teachers to use Frog VLE?

Thank you for your kind co-operation in taking part in this interview session.

STUDENTS' QUESTIONS (English version)

8. Is today's lesson a typical example of a lesson with Frog VLE integration? (for this subject & other subjects too) Yes/No? How similar/different?
   - Are there always a lot of group tasks?
   - Do you prefer a lot of pairwork & group tasks or do you like teachers to talk more? Why?
   - Do you always have the same group members or do they change? Do you prefer to always stick with the same group members? Why/why not?
   - Do your teachers usually use Frog VLE to share lesson notes, articles, or assign homework?

9. Could you describe if there are any problems whilst using Frog VLE?
   - How good are you in using computer?
   - How familiar are you in using Frog VLE?
   - If you experience problems in using Frog VLE, is there anyone to help you solve the problem? (in school & at home)
   - Are you satisfied with the internet connection in this school? Does having to share computers/device with your friends seem to be a problem to you?
   - Do you have any problems using Frog VLE outside the class/school compound? Do you have access to internet & computer?

10. What is your opinion on using Frog VLE as part of your learning process?
    - How different are lessons and your learning experience now that you are using Frog VLE?
    - How does the use of Frog VLE help you to understand the topic?
    - How does the use of Frog VLE help you to prepare for your assignments / assessments?
    - Do you use Frog VLE only when your teachers ask you to do so? If yes, why not at other times? If no, what features of Frog VLE do you usually use (i.e. articles/notes, question banks, forum)
    - How often do you send your assignments to your teachers via Frog VLE?
    - Do you receive feedback from your teachers regarding your assignments via Frog VLE? Have you received feedback from your teachers outside school hours?
    - Do you ask questions to your teachers via Frog VLE? Do your teachers answer your questions via Frog VLE?
    - Do you find that you tend to ask more questions to your teachers regarding the lessons now that you're using Frog VLE?
    - Are you more motivated to study with the use of Frog VLE? Why/why not?

11. Would you like to have more lessons that use Frog VLE (not necessarily for this subject)? Why/why not?
    - Do you receive encouragement/support to use frog VLE (i.e. from teachers, parents, school principal, friends)

Thank you for your kind co-operation in taking part in this session.

APPENDIX 5

Interview Schedule (proposed guideline): Policymaker (BTP)

1. VLE background:
   - Could you kindly highlight some milestones, key points or important decisions in relation to the implementation of VLE in Malaysian schools?
   - What is/are the objective(s) of VLE implementation, with regard to the implementation in Malaysian schools?
   - To date, how do you see/to what extent have the objectives been achieved?
   - What are some of the measures taken by MoE (i.e. BTP) to help ensure the objectives are met?

2. Barriers/challenges:
   - How are the responses from schools (administrators & especially teachers) regarding the Frog VLE initiative?
   - What are some of the challenges faced by you and your team as policymakers, in particular while trying to encourage teachers to utilise Frog VLE for their teaching & learning?

3. VLE & teachers' professional practice:
   - Based on my data collection (observation & initial findings), many teachers use Frog VLE as supplement to classroom teaching & learning (i.e. to provide additional notes, homework/assignments). Not many teachers utilise Frog VLE as a catalyst to create a setting for 21st century teaching & learning. What is your comment regarding this?
   - What is your comment on teachers who (a) have never created / developed learning sites & (b) have developed some learning sites but have not shared them in the MOE repository?

4. CPDs:
   - How often does BTP conduct CPD sessions for teachers? (VLE integration & development of Learning Sites)
   - Please elaborate how the CPDs are usually conducted (i.e. focus of the CPDs -> content? Technical aspects?)

5. Refer to the Teacher ICT Integration Model & seek opinion / comment.
   - Why is it so?

6. New Government:
   - With the new government / MOE top management, will VLE stay? Why? Why not?
   - Looking forward, what's next?

7. Others:
   - KPIs: current KPI only involve student logins? What about teachers' utilisation?

CLASSROOM OBSERVATION

SECTION A: Background

No.	Item	Answer
1	Name of School (use code)	
2	Teacher's Identifier	
3	Class	
4	Date & Time	
5	Subject	
6	Topic	
7	Number of students per class	
8	Location of lesson (classroom / lab, etc)	

SECTION B: Summary of The Teaching and Learning Activities

Use the following indicators to fill in the observation form & add comments when necessary.

Item	Indicator	
(A) Teacher / Teaching Style	A1	Teacher acts as a facilitator / mediates activity.
	A2	Teacher uses teacher talk.
	A3	Teacher gives instructions to students.
	A4	Teacher elicits information from students.
	A5	Teacher provides feedback to students' tasks.
	A6	Teacher demonstrates competency in subject/topic being taught.
	A7	Teacher demonstrates good ICT / VLE knowledge, skills & handling.
	A8	There is evidence that the teacher answers the students' questions either via face-to-face or through VLE.
(B) Classroom Instruction / activities	B1	Whole group
	B2	Small group
	B3	Pairs
	B4	Individual
	B5	Teacher one-to-one with student
(C) Student Behaviour	C1	Students show interest to lesson (i.e. body language, facial expressions).
	C2	Active participation from majority.
	C3	There is evidence that students enjoy completing tasks that incorporate VLE.
	C4	There is evidence that students ask appropriate questions either via face-to-face or through VLE.

Item	Indicator	
	C5	Students demonstrate good ICT / VLE knowledge, skills & handling.
(D) Classroom Culture	D1	Active participation was encouraged.
	D2	There is a climate of respect for students' ideas, questions & contributions.
	D3	Interactions reflect collaborative working relationships between teacher and students.
	D4	Interactions reflect positive working relationships between students.
(E) VLE integration	E1	To support teacher's explanation.
	E2	As student activity/task during lesson in class.
	E3	To support student collaboration (group/pair work).
	E4	As communication/discussion outside class hours.
	E5	As part of homework.
	E6	Others (specify).

OBSERVATION FORM

Time	(A) Teacher / Teaching Style	(B) Classroom Instruction/activities	(C) Student Behaviour	(D) Classroom Culture	(E) VLE Integration	Comments
0.00						
0.05						
0.10						
0.15						
0.20						
0.25						
0.30						
0.35						
0.40						
0.45						
0.50						
0.55						
0.60						
1.05						
1.10						
1.15						
1.20						

Additional information:

Was the lesson implemented as planned? If no, what happened? What changes occurred?

_____

_____

_____

_____

CONSENT FORM
(School – Case Study)

Project Title
Examining Virtual Learning Environment (VLE): Utilisation Factors and Impact on Post-primary National Schools in Malaysia.

Researcher
Ruzana Tukimin, School of Education, Trinity College Dublin
Contact information: tukiminr@tcd.ie / Telephone (Malaysia): 019-3571102

Research Supervisor
Dr. Keith Johnston, School of Education, Trinity College Dublin
Contact information: kjohnsto@tcd.ie

Purpose of this study
This study evolves around identifying significant factors influencing teachers' use of VLE and exploring the impact of VLE implementation on teachers' professional practice as well as teacher-student relationship. Consequently, this study aims to suggest measures to improve the utilisation of VLE among post-primary school teachers in Malaysia.

How will research findings be used?
Data collected within this study will be published as a thesis for a Doctor of Philosophy qualification at Trinity College Dublin, The University of Dublin, Ireland. The final result of this study may also be used by the Ministry of Education (MOE) Malaysia, to improve specifically the utilisation of VLE in Malaysian schools in an effort to scale up quality learning, as specified in the Malaysia Education Blueprint 2013-2025 (Pre-School to Post-Secondary Education).

Research Methods
As a participant for this research, your school community would be engaged within the research method and form of data collection outlined in the table below.

Approach	Timing	Purpose
School Administrator Interview	15 - 20 minutes	Explore school administrators' perspectives on VLE integration for teaching and learning.
Teacher Interview 3 teachers with these criteria: ▪ Teachers who are excellent/regular users of VLE ▪ All teachers should teach the Lower Form students;	30 – 40 minutes per interview	• Explore individual teacher's view & experience on VLE integration for teaching and learning; • Gauge the teachers' opinion & experience as VLE content-developers; • Identify the impact of VLE integration on teacher-student. relationship.
Classroom Observations (Lessons that integrate VLE)	One lesson per selected teacher	• Explore the impact of VLE integration on teacher-student relationship; • Opportunity to observe activities, behaviours & interactions as they happen.

Approach	Timing	Purpose
Student Focus Groups ▪ 3 Student Focus Groups comprising of 4 students per group	15 – 20 minutes per session	▪ Understand the students' opinion and feelings about participating in a lesson with VLE integration; ▪ Identify the implications of VLE on teacher-student relationship.

Management of Data
All data will be stored in a password locked computer and will not be left unattended on the computer screen. Data collected will only be available to the researcher and supervisor. Upon completion of this study and subsequent publications, all data collected will be appropriately destroyed.

Anonymity and Confidentiality
The data provided during this study may not be anonymous to the researcher, but will remain anonymous in the representation of data throughout the collection process, within the thesis, and research dissemination. To ensure anonymity throughout the research study, participants' responses will be represented with an identifier (i.e. School Administrator One = SA 1).

Risks and Right to Refuse or Withdraw
This study does not involve any type of physical risk. At any time throughout this research, you may withdraw your consent without providing reason for withdrawal. If you request to withdraw there will be zero repercussions, either personally or professionally, and all data will be immediately extracted and deleted appropriately by the researcher.

Right to Ask Questions
You have the right to ask questions about this study and to have those questions answered by the researcher before, during or after the research.
Consent (Please answer ALL of the following by placing a tick (✓) at the appropriate box)

No.	Statement	Yes	No
1	**I have read and understood what this project is about.**		
2	**I have read and understood what the results of this study will be used for.**		
3	**I am fully aware of all the procedures involving my school community, and of any risks and benefits associated with the study.**		
4	**I am aware that all responses will be kept confidential and properly managed (including storage & destruction of data).**		
5	**I know that my school community's participation is voluntary and that I or any of the participants can withdraw from the project at any stage without giving any reason.**		

Your signature indicates that you understand the above information and agree to your school's participation in this research study.

School Administrator Consent Signature:

APPENDIX 8

CONSENT FORM (Teacher – Case Study)

Project Title
Examining Virtual Learning Environment (VLE): Utilisation Factors and Impact on Post-primary National Schools in Malaysia.

Researcher
Ruzana Tukimin, School of Education, Trinity College Dublin
Contact information: tukiminr@tcd.ie / Telephone (Malaysia): 019-3571102

Research Supervisor
Dr. Keith Johnston, School of Education, Trinity College Dublin
Contact information: kjohnsto@tcd.ie

Purpose of this study
This study evolves around identifying significant factors influencing teachers' use of VLE and exploring the impact of VLE implementation on teachers' professional practice as well as teacher-student relationship. This study aims to suggest measures to improve the utilisation of VLE among post-primary school teachers in Malaysia.

How will research findings be used?
Data collected within this study will be published as a thesis for a Doctor of Philosophy qualification at Trinity College Dublin, The University of Dublin, Ireland. The final result of this study may also be used by the Ministry of Education (MOE) Malaysia, to improve specifically the utilisation of VLE in Malaysian schools in an effort to scale up quality learning, as specified in the Malaysia Education Blueprint 2013-2025 (Pre-School to Post-Secondary Education).

Research Methods
As a participant for this research, you and your students would be engaged within the research method and form of data collection outlined in the table below.

Approach	Timing	Purpose
Teacher Interview	(30-40 min)	• Explore individual teacher's view & experience on VLE integration for teaching and learning; • Gauge the teachers' opinion & experience as VLE content-developers; • Identify the impact of VLE integration on teacher-student relationship.
Classroom observation (lesson that integrates VLE)	One lesson	• Explore the impact of VLE integration on teacher-student relationship; • Opportunity to observe activities, behaviours & interactions as they happen.

Management of Data
Data referred to in this study are all instruments (questionnaire & interview & focus group questions, & observation checklist), voice-recording files, interview transcribes, consent forms and other research documents. All data will be stored in a password locked computer and will not be left unattended on the computer screen. Data collected will only be available to the researcher and supervisor. Upon completion of this study and subsequent publications, all data collected will be appropriately destroyed.

Anonymity and Confidentiality
The data you provide during this study may not be anonymous to the researcher, but will remain anonymous in the representation of data throughout the collection process, within the thesis, and research dissemination. To ensure anonymity throughout the research study, teachers will be represented with a Teacher Identifier (i.e. Teacher One = TCHR 1).

Risks and Right to Refuse or Withdraw
This study does not involve any type of physical risk. At any time throughout this research, you may withdraw your consent without providing reason for withdrawal. If you request to withdraw there will be zero repercussions, either personally or professionally, and all your data will be immediately extracted and deleted appropriately by the researcher.

Right to Ask Questions
You have the right to ask questions about this study and to have those questions answered by the researcher before, during or after the research.

Consent (Please answer ALL of the following by placing a tick (✓) at the appropriate box)

No.	Statement	**Yes**	**No**
1	**I have read and understood what this project is about.**		
2	**I have read and understood what the results of this study will be used for.**		
3	**I am fully aware of all the procedures involving myself, and of any risks and benefits associated with the study.**		
4	**Permission is given for my responses to be voice-recorded only for the purpose of this study.**		
5	**I am aware that all responses will be kept confidential and properly managed (including storage & destruction of data).**		
6	**I know that my participation is voluntary and that I can withdraw from the project at any stage without giving any reason.**		

Your signature indicates that you understand the above information and agree to your participation in this research study.

Teacher Consent:
Please sign your name _____

Name of participant _____ *Date*_____

APPENDIX 9

CONSENT FORM
(Student –Group Interview)

Project Title
Examining Virtual Learning Environment (VLE): Utilisation Factors and Impact on Post-primary National Schools in Malaysia.

Researcher
Ruzana Tukimin, School of Education, Trinity College Dublin
Contact information: tukiminr@tcd.ie / Telephone (Malaysia): 019-3571102

Research Supervisor
Dr. Keith Johnston, School of Education, Trinity College Dublin
Contact information: kjohnsto@tcd.ie

Purpose of this study
This study focuses on identifying significant factors influencing teachers' use of VLE and exploring the impact of VLE implementation on teachers' professional practice as well as teacher-student relationship.

How will research findings be used?
Data collected within this study will be published as a thesis for a Doctor of Philosophy qualification at Trinity College Dublin, The University of Dublin, Ireland. The final result of this study may also be used by the Ministry of Education (MOE) Malaysia, to improve specifically the utilisation of VLE in Malaysian schools in an effort to scale up quality learning, as specified in the Malaysia Education Blueprint 2013-2025 (Pre-School to Post-Secondary Education).

Research Methods
1) I (as the researcher) will be present in **one** of your class sessions conducted by your teacher (insert teacher's name). During this particular lesson observation, quotes or behaviours related to the use of VLE may be recorded and included within this study;
2) As a participant for this research, you may be selected to take part in a student discussion group (4 students per group) with the researcher, where you will be asked to share your learning experience using the VLE. Any arrangement of time and place for the student discussion group will be carefully made to ensure that your studying time and safety will not be affected.

Management of Data
All data will be stored in a password locked computer and will not be left unattended on the computer screen. Data collected will only be available to the researcher and supervisor. Upon completion of this study and subsequent publications, all data collected will be appropriately destroyed.

Anonymity and Confidentiality
The data you provide during this study may not be anonymous to the researcher, but will remain anonymous in the representation of data throughout the collection process, within the thesis, and research dissemination (i.e. conferences, further publications). To ensure anonymity throughout the research study, you will be represented with a Student Identifier, (i.e. Student One = SN 1).

Risks and Right to Refuse or Withdraw
This study does not involve any type of physical risk. At any time throughout this research, you may withdraw your consent without providing reason for withdrawal. If you request to withdraw there will be zero repercussions, either personally or professionally, and all your data will be immediately extracted and deleted appropriately by the researcher.

Right to Ask Questions
You or your parent have the right to ask questions about this study and to have those questions answered by the researcher before, during or after the research.

Consent (Please answer ALL of the following by placing a tick (✓) at the appropriate box)

No.	Statement	**Yes**	**No**
1	**With my parent, I have read and understood what this project is about.**		
2	**With my parent, I have read and understood what the results of this study will be used for.**		
3	**My parent and I are fully aware of all the procedures involving myself, and of any risks and benefits associated with the study.**		
4	**Permission is given for my responses to be voice-recorded only for the purpose of this study.**		
5	**My parent and I are aware that my responses will be kept confidential and properly managed (including storage & destruction of data).**		
6	**My parent and I know that my participation is voluntary and that I can withdraw from the project at any stage without giving any reason.**		

Your signature indicates that you understand the above information and agree to your participation in this research study.

Student Consent:
Please sign your name

_____
Name of participant
_____*Date*_____

By signing this document, I agree to my child's participation in the study and the research methods as outlined in this consent form. I know that I may contact the researcher at any time if I have questions or concerns regarding my child's participation in this study.
Parent Consent:
Please sign your name:

_____
Name of parent: _____

APPENDIX 10

CONSENT FORM
(School Administrator / Policymaker)

Project Title
Examining Virtual Learning Environment (VLE): Utilisation Factors and Impact on Post-primary National Schools in Malaysia.

Researcher
Ruzana Tukimin, School of Education, Trinity College Dublin
Contact information: tukiminr@tcd.ie / Telephone (Malaysia): 019-3571102

Research Supervisor
Dr. Keith Johnston, School of Education, Trinity College Dublin
Contact information: kjohnsto@tcd.ie

Purpose of this study
This study evolves around identifying significant factors influencing teachers' use of VLE and exploring the impact of VLE implementation on teachers' professional practice as well as teacher-student relationship.

How will research findings be used?
Data collected within this study will be published as a thesis for a Doctor of Philosophy qualification at Trinity College Dublin, The University of Dublin, Ireland. The final result of this study may also be used by the Ministry of Education (MOE) Malaysia, to improve specifically the utilisation of VLE in Malaysian schools in an effort to scale up quality learning, as specified in the Malaysia Education Blueprint 2013-2025 (Pre-School to Post-Secondary Education).

Research Methods
As a participant for this research, you would be engaged within the research method and form of data collection outlined in the table below.

Approach	Timing	Purpose
School Administrator / Policymaker Interview	15 - 20 minutes	Explore school administrators' / policymaker's perspectives on VLE integration for teaching and learning.

Management of Data
All data will be stored in a password locked computer and will not be left unattended on the computer screen. Data collected will only be available to the researcher and supervisor. Upon completion of this study and subsequent publications, all data collected will be appropriately destroyed.

Anonymity and Confidentiality
The data you provide during this study may not be anonymous to the researcher, but will remain anonymous in the representation of data throughout the collection process, within the thesis, and research dissemination. To ensure anonymity throughout the research study, your responses will be represented with an identifier (i.e. School Administrator One = SA 1).

Risks and Right to Refuse or Withdraw

This study does not involve any type of physical risk. At any time throughout this research, you may withdraw your consent without providing reason for withdrawal. If you request to withdraw there will be zero repercussions, either personally or professionally, and your data will be immediately extracted and deleted appropriately by the researcher.

Right to Ask Questions
You have the right to ask questions about this study and to have those questions answered by the researcher before, during or after the research.

Consent (Please answer ALL of the following by placing a tick (✓) at the appropriate box)

No.	Statement	**Yes**	**No**
1	**I have read and understood what this project is about.**		
2	**I have read and understood what the results of this study will be used for.**		
3	**I am fully aware of all the procedures involving myself, and of any risks and benefits associated with the study.**		
4	**Permission is given for my responses to be voice-recorded only for the purpose of this study.**		
5	**I am aware that all responses will be kept confidential and properly managed (including storage & destruction of data).**		
6	**I know that my participation is voluntary and that I can withdraw from the project at any stage without giving any reason.**		

Your signature indicates that you understand the above information and agree to your participation in this research study.

Consent:
Please sign your name
_____

Name of participant _____
*Date*_____

APPENDIX 11

Examining Virtual Learning Environment (VLE): Utilisation Factors and Impact on Post-primary National Schools in Malaysia

Questionnaire Feedback Form / Borang Maklum Balas Soal Selidik

Please provide your feedback on the questionnaire according to the following aspects.
Mohon kerjasama tuan/puan supaya memberikan maklum balas berkaitan soal selidik berdasarkan perkara berikut.

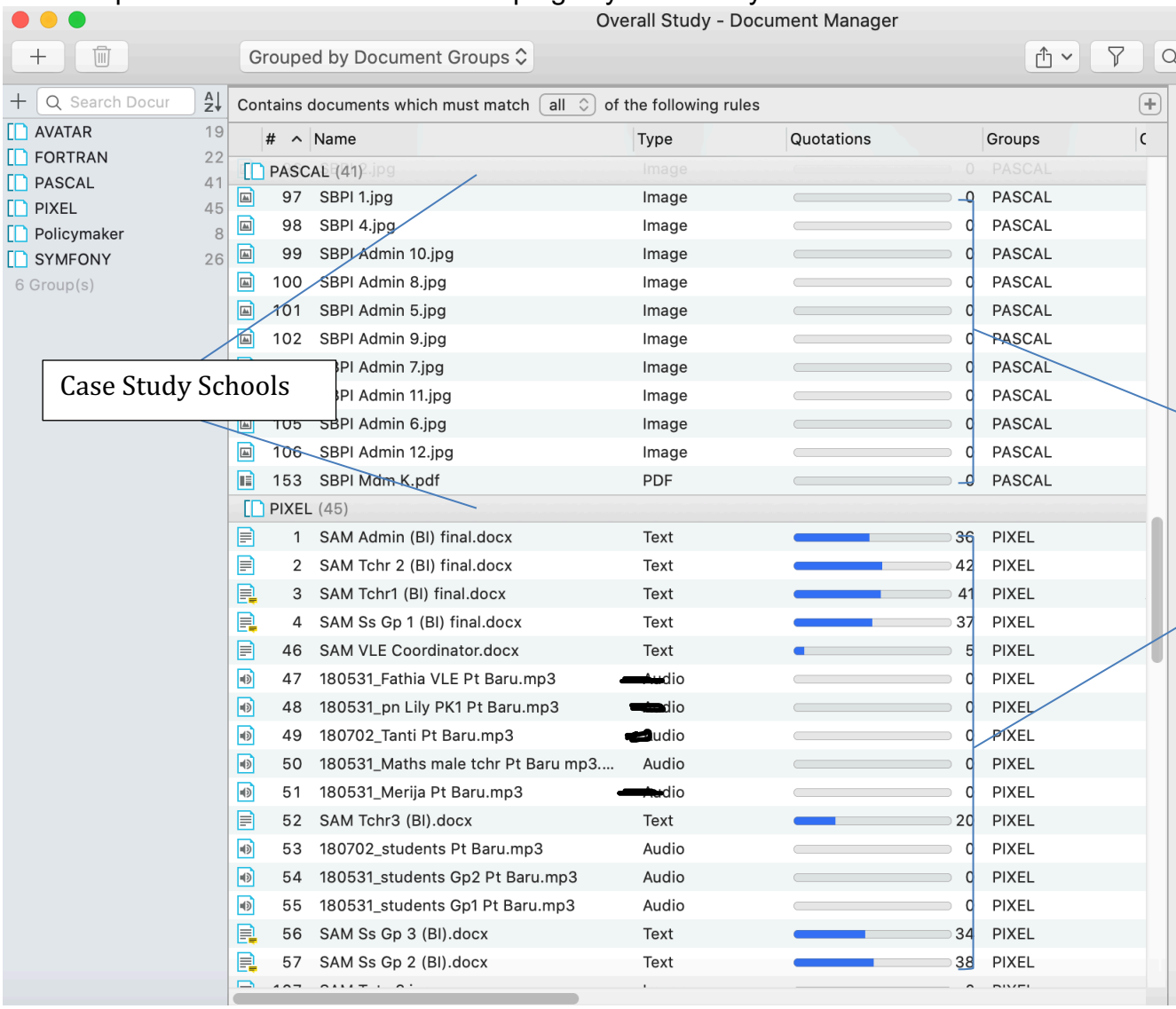
Time taken to complete questionnaire: _____minutes Masa yang diambil untuk melengkapkan soal selidik: _____ minit Overall comment on questionnaire length and layout: Komen keseluruhan mengenai panjang dan susun atur soal selidik:
Please indicate if there are questions that are unclear or raise any other difficulty for the respondents. Sila nyatakan sekiranya terdapat soalan yang kurang jelas atau boleh menimbulkan kesukaran kepada responden.
Any other relevant issues that are not included in the questionnaire? Sila nyatakan sekiranya terdapat isu-isu lain yang berkaitan yang tidak disertakan dalam soal selidik.
General comments: Komen umum:

Thank you for your co-operation / Terima kasih atas kerjasama tuan/puan.

All information obtained from this questionnaire and feedback form will be treated in confidence and used for questionnaire development purposes only. Data obtained will not be included in the research results.
Semua maklumat daripada soal selidik dan borang maklum balas ini dianggap sulit dan hanya akan digunakan untuk penambahbaikan soal selidik. Data tidak akan digunakan sebagai sebahagian daripada dapatan kajian.

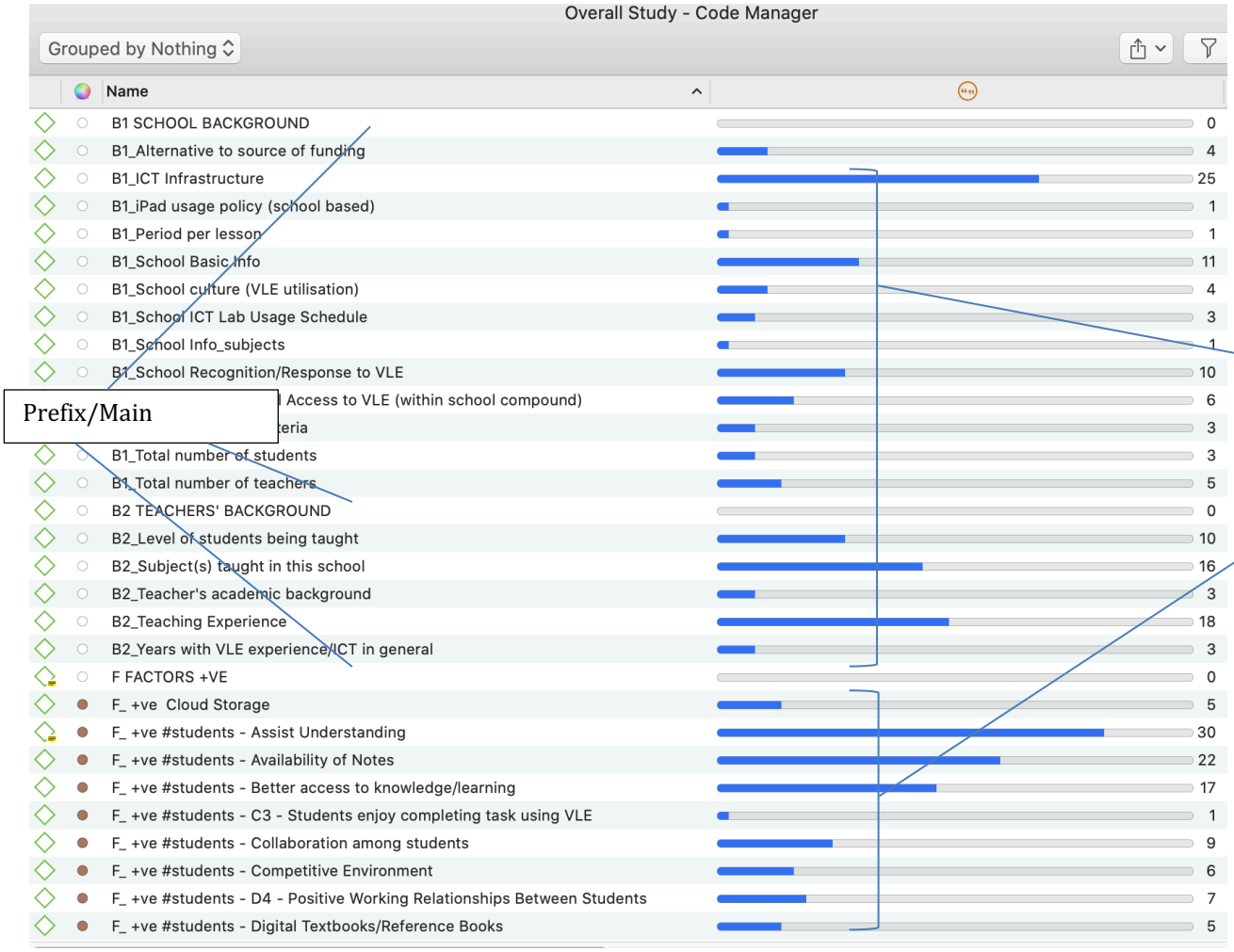
APPENDIX 12

An example of ATLAS.ti Document Groupings by case study schools.



APPENDIX 13

An example of ATLAS.ti Code Manager list (in Capital Letters).



An example of Codebook output generated using the Query Tool in ATLAS.ti

6:10 They can search for all sorts of things. But this year we haven't had the time to do much. Usually I...

In Document:
6 SBPI Tchr2 (BI) fi[redacted]cx

Coding:
- F_ +ve #students - Better access to knowledge/learning
- F_ +ve #students - Collaboration among students

Codes

Content:
They can search for all sorts of things. But this year we haven't had the time to do much. Usually I ask them to build something like a site. For example, for a subject or particular topic, build this site… but this year we haven't had the time.

6:15 the students also act like facilitators to help conduct their own groups

In Document:
6 SBPI Tchr2 (BI) fi[redacted]cx

Coding:
- F_ +ve #students - Collaboration among students

Content:
the students also act like facilitators to help conduct their own groups

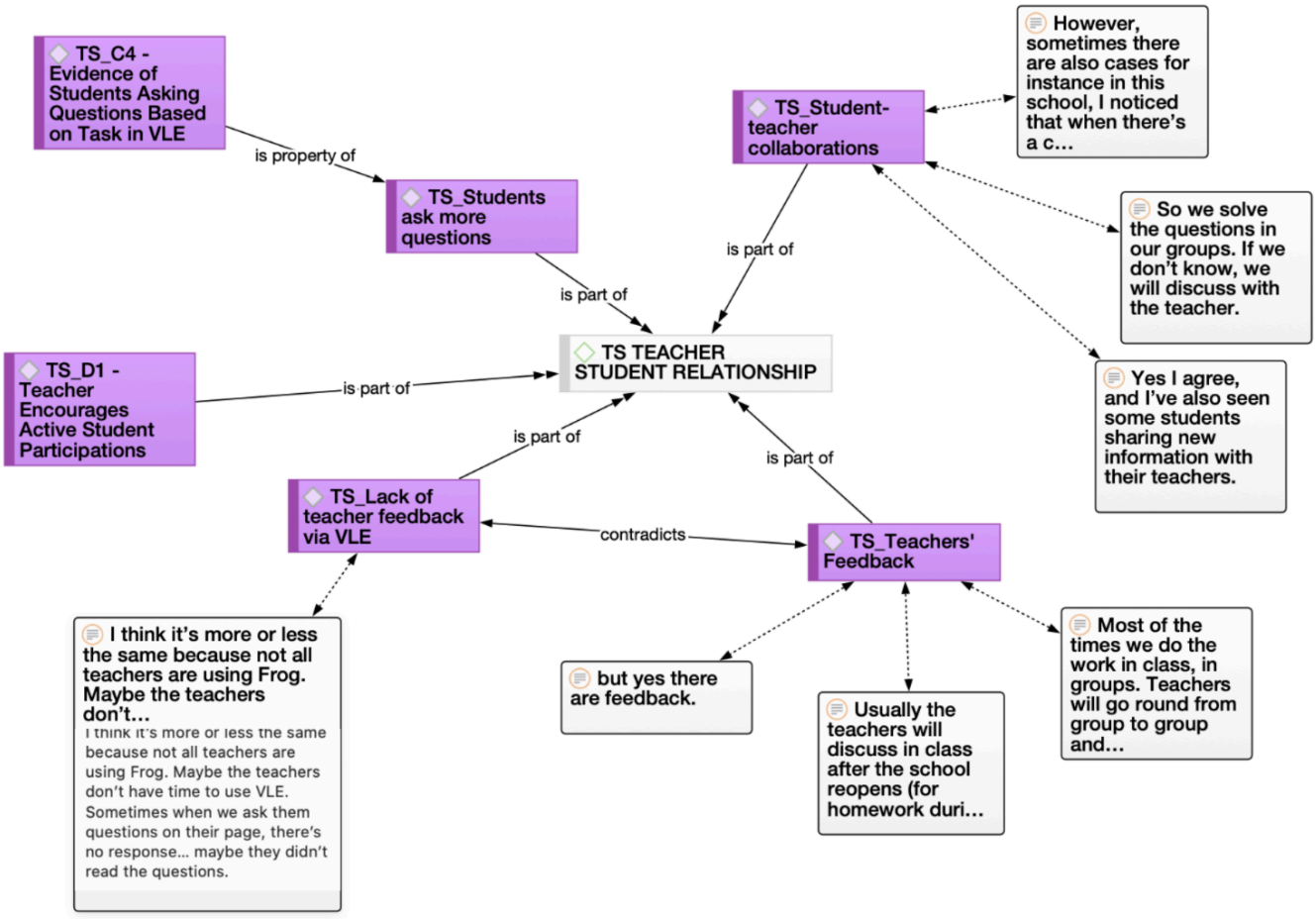
9:10 it's easy to disc[redacted]ss. You don't necessarily have to meet face-to-face if you want to discuss.

In Document:
9 SBPI Ss Group 1 (B[redacted]al.docx

Coding:
- F_ +ve #students - Collaboration among students
- F_ +ve #students - Reasons for students liking VLE

Content:
it's easy to discuss. You don't necessarily have to meet face-to-face if you want to discuss.

An example of display in Network Manager, depicting how the codes relate to one another.



APPENDIX 16

SUBJECTS AND TIME ALLOCATION FOR MALAYSIAN POST-PRIMARY NATIONAL SCHOOLS (Forms 1, 2 and 3)

REF.	SUBJECTS	TIME ALLOCATION PER WEEK (HOUR)
	Core Subjects	
1.	Malay Language	4.0
2.	English Language	3.5
3.	Mathematics	3.5
4.	Science	3.5
5.	History	2.0
6.	Islamic Studies/Moral Education	4.0
	Compulsory Subjects	
7.	Physical & Health Education	2.0
8.	Geography	1.5
9.#	Design Technology (RBT)	2.0
	Basic Computer Science	
10.#	Visual Arts	1.0
	Music	
	Electives	
11.	Other Languages (i.e. Chinese/Tamil/Iban/French/Japanese)	2.0
	Arabic language in Religious Schools	3.0
School Assembly		0.5

#Students select one option.

Source: Bahagian Pembangunan Kurikulum (2016:17).

APPENDIX 17

SUBJECTS AND TIME ALLOCATION FOR MALAYSIAN POST-PRIMARY NATIONAL SCHOOLS (Forms 4 and 5)

REF	SUBJECTS	TIME ALLOCATION PER WEEK (HOUR)
Core Subjects		
1.	Malay Language	4.0
2.	English Language	3.5
3.	Mathematics	3.5
4.	Science	3.5
5.	History	2.0
6.	Islamic Studies/Moral Education	3.0
Compulsory Subjects		
7.	Physical & Health Education	2.0
School Assembly		0.5
Electives		
8.	Other Languages (i.e. Chinese/Tamil/Iban/French/Japanese)	2.0
9.	STEM (i.e. Physics, Chemistry, Biology, Additional Mathematics, Computer Science)	3.0
10.	Advanced Islamic Studies (i.e. Al-Quran and Al-Sunnah, Islamic Sharia, Arabic Language)	3.0
11.	Arts and Humanities (i.e. Accounting Principles, Economy)	3.0
	Arts and Humanities (i.e Visual Arts, Music, Geography, Malay Literature, English Literature).	2.0

Note: Students are allowed to take between 2 to 12 hours per week of elective subjects (combination of subjects).

Source: Bahagian Pembangunan Kurikulum (2016:18-21).

CALCULATION EXAMPLE FOR ACTUAL INTEGRATION OF THE VLE PLATFORM IN TEACHING AND LEARNING

Basic assumptions:

a) Average teaching period per teacher: 17 hours per week (TALIS report);
b) Time allocations per subject as stipulated in Appendix 16 and Appendix 17;
c) One period of class session = 30 minutes (schools typically added 5 minutes in the school timetable for transition process including movement of teachers and students between periods).

Example: Mr. Ali teaches Additional Mathematics (3 hours per week per class).
Calculations:

i) Number of Additional Mathematics lessons per week for Form 5A → 4 lessons [2 double period sessions (2 hours total) plus 2 single periods (1 hour total).
ii) Potential Additional Mathematics lessons with integration of VLE platform (per month) for Form 5A → between once a month to a maximum of 16 times (if utilised in every period; 4 lessons per week x 4 weeks per month).
iii) Calculation to match with TALIS average: $\frac{17 \text{ (hours)}}{3 \text{ (hours)}} = 5.7$
iv) Hence, Mr. Ali teaches between 5 to 6 classes to suit the TALIS average.
v) Mr. Ali potentially integrates the VLE platform 5 to 6 times per month if integration is only once a month.