ESTEEM
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Volume 5, No. 2, September 2021

E S T E E M
JOURNAL OF SOCIAL SCIENCES AND HUMANITIES

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Journal Description

Introduced in 2017, ESTEEM Journal of Social Sciences and Humanities is an official journal of Universiti Teknologi MARA (UiTM) Cawangan Pulau Pinang with a registered e-ISSN 2600-7274. It is an open-access journal that published articles both in English and Bahasa Malaysia. Initially, it was published once a year from January 2017 to December 2020, but its publication frequency was revised to twice a year starting January 2021to accommodate the increasing number of manuscript submissions. The journal adheres to traditional standards of double-blind peer review with an average acceptance rate of 30%. Currently, the journal does not charge any article processing fees for manuscripts submitted personally or collaboratively by authors.

Aim and Scope

The ESTEEM Journal of Social Sciences and Humanities aims to serve as a platform for scholars, practitioners, and policymakers to exchange new knowledge and ideas in areas related to social sciences and humanities. The journal provides an avenue for scholars and practitioners to document unpublished, original manuscripts related to emerging issues, developments and trends that examine how people interact, integrate, behave and influence the world around them. Specifically, the journal aims to provide new knowledge on the relationships between individuals and societies and the operation and progression of societies in the 21st century.

The key topics covered in the journal relate to emerging issues, trends and challenges that shape individuals' perceptions, attitudes and behaviours across societies, businesses, industries, and governments worldwide. As the journal covers two separate but interrelated areas of social sciences and humanities, authors are welcomed to submit manuscripts that systematically investigate questions around humanities development, namely language, linguistics, culture, arts, religion, health and wellbeing. For social sciences, the journal invites manuscripts related to human psychology and sociology in education, law, political science, business, hospitality, among others.

Frequency of Publication

- January 2021 to present: ONE (1) volume TWO (2) issues per year, published in April and September.
- January 2017 to December 2020: ONE (1) volume ONE (1) issue per year, published in November.
- The publication frequency of the journal does not include special issues.

Duration of Publication Process

Based on current practice, the publication process takes approximately 90 – 120 days. All manuscripts are processed accordingly:

- Review Process (within 30 days after the closing date)
- Notification of Acceptance (within 10 days after the review process)
- Revision (within 30 days after the manuscript acceptance)
- Copy Editing (within 10 days after final revision)
- Publication (within 10 days after the copy-editing process)

Peer Review Process

ESTEEM Journal of Social Sciences and Humanities relies on effective peer review processes to uphold the quality and validity of individual articles and the overall integrity of the journal. The journal practices a double-blind peer review consisting of at least two to three peer reviewers per manuscript to maintain the quality. All reviewers from diverse expertise are on a voluntary basis. Throughout the double-blind review process, the editors hide both reviewer and author identities from one another. To facilitate this, the editors need to ensure that the manuscripts are processed in a way that does not give away the identity of its author. The editors make sure that the manuscript does not include names or affiliations of the author. This ensures the manuscript is judged fairly, keeping bias out of the equation. Both author and reviewer also benefit from some degree of protection against criticism.

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Editorial Note

Anderson Ngelambong

EDITORIAL NOTE

On behalf of the ESTEEM Journal of Social Sciences and Humanities (EJSSH) Editorial Team, I am pleased to present Volume 5, Issue No. 2, September 2021. We have received 40 manuscripts for this issue, primarily from Malaysian scholars. A total of 12 manuscripts were accepted for publication after the stringent review process, representing a 30% acceptance rate.

This issue covered topics related to emerging issues, trends, and challenges in social sciences and humanities. Three manuscripts are on impacts of the Coronavirus Disease (COVID-19) that has been haunting the world since early 2020. The effect is significantly seen in all fields across the board. One research looked at the perceptions of mothers with children and working from home during the pandemic. Another looked at the impact on tourism, specifically on destination branding. The third looked at a Malaysian public university's effort to ease the suffering of needy people during the outbreak. The other manuscripts are on a wide range of research topics that will contribute to their specific research areas. Some cover both areas of social sciences and humanities.

We hope to get more good quality manuscripts from international scholars as one of this journal's primary goals is to publish manuscripts from diverse international scholars that will help enrich further the discourse on the EJSSH. We have expanded our editorial team and included outstanding international academics to address the gaps and enhance this journal. We welcome any papers that you wish to submit, individually or collaboratively. They are much appreciated and will make a significant contribution to the sustainability of this journal. Thank you in advance for your contribution to the EJSSH. We hope you will enjoy the fruits of our labour. We welcome any constructive feedback and comments.

Finally, we would like to extend our sincere gratitude to all contributors, the authors, reviewers, and Editorial Team members, whose efforts have made this issue possible. Together, we make it great.

Editor-in-Chief

Anderson Ngelambong, Ph.D
ESTEEM Journal of Social Sciences and Humanities
Universiti Teknologi MARA Cawangan Pulau Pinang

A Preliminary Study on Third Tone Sandhi in Malaysian Mandarin

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ABSTRACT

Mandarin Chinese language has increased in importance among the Chinese community in Malaysia. At present, the Mandarin language is the only medium of instruction in Chinese schools, but it has also become a lingua franca of local Chinese Malaysians of various dialect groups. With the expansion of the Global Chinese concept, numerous studies have been carried out on the Mandarin language used in Malaysia (henceforth, Malaysian Mandarin). These studies have mainly focused on lexical and syntactic aspects rather than on the phonetic system of Malaysian Mandarin. This could be because many researchers consider the standard spoken form of Malaysian Mandarin similar to Standard Mandarin, although they are different. To better understand the development of the sound systems in regional Mandarin varieties, this paper investigates Malaysian Mandarin, specifically the standard spoken variety, by examining the acoustic realisation of third tone sandhi, a well-known Mandarin language tonal variation phenomenon. Forty-four Malaysian Chinese undergraduate students have been selected as speakers of the standard spoken variety. A nursery rhyme consisting of nineteen third tone (T3) syllables was used as the reading material to analyse the effect of different prosodic and syntactic structures on T3 realisation. The findings indicated that generally, the T3 sandhi phenomena in Malaysian Mandarin match Standard Chinese's sandhi rule. However, the acoustic realisation of T3 in terms of pitch contour and voice quality showed some differences. The implementation of T3 sandhi is also affected by the syntactic and rhythmic structure if a disyllabic or trisyllabic T3 sequence occurs across two feet. The findings suggest that the prosodic structure in the standard spoken form of Malaysian Mandarin may be developing differently from Standard Mandarin.

1. INTRODUCTION

In pace with the growing demand for learning Mandarin Chinese (henceforth Mandarin), the research on Mandarin use by overseas Chinese communities and second language learners has a corresponding increasing trend. The Chinese academia shows interest to investigate Mandarin varieties outside of China, such as in Singapore, Malaysia, Thailand, and Indonesia. If compared to lexical and syntactic aspects, the study on phonetics is still lacking. This paper explores the standard spoken form of Mandarin in Malaysia by examining the acoustic realisation of third tone sandhi, a well-known Mandarin tonal variation phenomenon. As mentioned, currently, there is more than one variety of Mandarin. This paper will use "Standard Chinese" to refer to the phonological system of Mandarin as summarised by the academia and "Mandarin" to refer to the spoken varieties of Mandarin to avoid confusion in the discussion.

1.1 The Current Status of Mandarin Usage in Malaysia

Malaysia, located in Southeast Asia, is a multi-ethnic and multilingual country ("Malaysia", 2021). According to the Department of Statistics Malaysia (2020), Malaysia's population in 2020 is estimated at 32.7 million, 90.9% citizens and 9.1% non-citizens. There are three major ethnic groups from the 29.7 million citizens, whereby 69.6% are Malay (*Bumiputera*), 22.6% are Chinese, and 6.9% are Indians.

As reported by Eberhard et al. (2021), with the exception of Standard Malay as the national language, English and Mandarin have been granted the status of statutory national working languages in Malaysia. This means that English and Mandarin are also used in working occasions at the national level but are not languages of national identity for Malaysian citizens (Eberhard et al., 2021). English is used widely in many sectors of Malaysia, such as business, media and private education (Pillai et al., 2015). Meanwhile, Mandarin is the medium of instruction in Chinese schools, lingua franca of the ethnic Chinese across various dialect groups, and is also used in business and media in Malaysia (Ghazali, 2012; Pillai et al., 2015).

The ethnically Chinese people in Malaysia primarily use Mandarin. The spread and expansion of the language at the international level are much lower than English. However, the economic rise of China has increased the need for learning Mandarin, which is the national language in China (this variety is generally known as *Putonghua*). Some researchers believe that Mandarin can become a global language after English (Diao, 2015; Goh, 2017). Based on the current situation, there are two groups of Mandarin users in Malaysia, the local Chinese ethnic speakers and Mandarin second-language speakers. The first group of speakers has a more extended usage history. They are the main contributors to Mandarin in Malaysia or Malaysian Mandarin, while the second group of speakers is developing and increasing.

1.2 A Global Perspective on Varieties of Mandarin Chinese

Following the international spread of Mandarin, more and more scholars are aware that the difference in Mandarin varieties exists and cannot be ignored. The concept of Global Chinese has been proposed to confront the issue of Mandarin varieties, and it has rapidly expanded in a short period. One of the academics, Diao (2015), explained the differences between Mandarin varieties from a historical perspective. Mandarin varieties in some regions such as Taiwan, Singapore, and Malaysia did not directly evolve from *Putonghua* (the Contemporary Standard Mandarin, henceforth, Standard Mandarin). These Mandarin varieties, including Standard Mandarin, are developed from the original version, the Traditional Mandarin (传统国语). Still, their evolution is based on different social and regional linguistic backgrounds (Diao, 2015). In

a multi-ethnic and multilingual country, Malaysia Mandarin has a development tendency and is represented in phonetic, lexical and syntax aspects (Khoo, 2017; Guo, 2017).

1.3 Problem Statement

Chinese academia conducted more linguistic studies on these Mandarin varieties, and they discussed language planning and standardisation issue across these varieties with the expansion of the concept of Global Chinese (Wang, 2020). However, previous descriptive studies of Mandarin varieties (including Malaysian Mandarin) mainly focused on the lexical and syntactic aspects, less on the pronunciation (Guo, 2017; Guo & Wang, 2018; Wang, 2017). Wang (2017) summarised that the study on the pronunciation of Mandarin varieties lacks because of the strong stability of the phonological system. Theoretically, the standard spoken form of the Mandarin variety is similar to Standard Mandarin, and the difference mainly occurs in the colloquial spoken form (Wang, 2017). This is not surprising as many researchers have a similar perspective on the standard spoken form, regardless of the language. Standard Mandarin in Malaysia is similar to standard Mandarin in China (Guo, 2017). Standard English in Malaysia is equated to standard English in British (Baskaran, 1987 and Morais, 2000, as cited in Pillai & Ong, 2018). There is still a shortage of systematic descriptions on realisation and features of the standard spoken form of a Mandarin variety. This may be why the implementation of the Standard Mandarin system in Malaysia's Chinese education is always an issue and frequently raised among the Chinese Malaysian community (Khoo, 2017). Hence, a standard spoken form should get more academic attention instead of only focusing on the colloquial spoken form.

Among the studies on phonetic variation in Malaysian Mandarin, the lexical tone gets some attention (Guo, 2017; Wang, 2017). A study by Khoo (2017) found that Malaysian Mandarin has some unique tonal variation that distinguishes it from Singaporean Mandarin, labelled the "federal accent". However, the feature of "federal accent" and how it is realised in the standard spoken and colloquial spoken forms remains unknown. In a tone language such as Mandarin, tonal variation in speech is non-linear, and it constantly interacts with prosodic and syntactic structure. It is not easy to have a comprehensive understanding if we exclude the prosodic syntax information in the tonal variation study. A specific lexical tone in various phonetic environments needs to be investigated instead of a general observation or case analysis to be more systematic. Among the four lexical tones of Standard Chinese, the sandhi phenomena of the third tone and its relation to a prosodic and syntactic structure are well investigated and understood. Hence, third tone sandhi is a suitable start point for a better understanding of the standard spoken form of Malaysian Mandarin. There are two research aims in this paper: 1) to investigate the acoustic features of T3 in utterances; 2) to explore the effect of syntactic and rhythmic structure on the implementation of T3 sandhi.

2. LITERATURE REVIEW

2.1 Lexical Tone System and Tone Sandhi of Standard Chinese

Standard Chinese is a tone language in which syllable pitch movement is used to distinguish word meaning. There are four contrastive lexical tones, first tone (T1) is described as "high-level ˥", second tone 2 (T2) is described as "high rising ˩˥", third tone (T3) is described as "low dipping ˨˩˦" and forth tone (T4) is described as "high falling ˥˩" (Duanmu, 2007; Peng et al., 2005). Below is the example of a syllable with four lexical tones written in Hanyu Pinyin (Duanmu, 2007, p. 225), "*mā*" (mother), "*má*" (hemp), "*mǎ*" (horse) and "*mà*" (scold).

Therefore, in Standard Chinese utterances, a pitch contour is not a linear sequence of intonation like in English. It is a superimposition of two-layer pitch movement, the surface contour of intonation, and a lexical tone's base contour. Thus, it is necessary to differentiate tone in isolation and tone in connected speech, even in a polysyllabic word: citation tone and sandhi tone (Chen, 2000; Duanmu, 2007).

In connected speech, almost all lexical tones have tonal variation. This phonetic phenomenon is named 'tone sandhi'. It is familiar and usually conditioned by tonal context and other prosodic factors such as stress, prosodic boundary, speech rate. Among the four lexical tones of Standard Chinese, T3 has the most variation, and T3 sandhi is the most notable. According to T3 sandhi rules, a realisation of preceding T3 depends on the tone category of the following syllable. If another T3 follows it, the preceding T3 will change to T2 (high rising tone), such as "*mǎ wěi*" (horsetail) → "maˊ weiˇ/˯ ". If it is followed by non-T3 (T1, T2 and T4), the preceding T3 will keep its underlying tone with the low feature, such as "*mǎ chē*" (carriage) →"maˇ cheˉ", "*mǎ tí*" (horse's hoof) →"maˇ tiˊ", "*mǎ shù*" (horsemanship)→"maˇ shuˋ".

However, T3 sandhi is quite complicated and relates to syntactic and rhythmic structure (Peng et al., 2005; Wang et al., 2018). If T3 appears in a phrase continuously and the phrase is right-branching structure, there are two or more possible tonal patterns. For example, the tonal patterns of *"[xiǎo [zhǐ [lǎohǔ]]]"* (small paper tiger) could be "ˊ - ˇ -ˊ - ˇ", "ˇ - ˊ - ˊ - ˇ" or "ˊ - ˊ - ˊ - ˇ" (Duanmu, 2007, p. 256). The example above shows that the possible changes always happen at a word boundary because syntactic relation across words is looser than within a word. It means the T3 sandhi is not only a phonetic phenomenon but also affected by other linguistic aspects, representing certain syntactic or rhythmic structures.

2.2 Previous Studies on Lexical Tone and Prosody of Malaysian Mandarin

As explained earlier, previous studies on phonetic aspects in Malaysian Mandarin is still lacking and not systematic. However, the descriptive studies on tone and prosodic features of Malaysian Mandarin started to increase after 2010. In addition, the way of analysis is not limited to pure auditory determination but also include some acoustic analysis. Researchers such as Guo (2017), Huang (2016), and Khoo (2017) mentioned that there is a new lexical tone category in Malaysian Mandarin apart from the four tone categories of Standard Chinese. It is realised as a falling tone with a shorter duration and ends with a glottal stop, and scholars usually call it the *"fifth tone"*. Based on their summary, it is commonly present in the everyday spoken variety and is influenced by the Chinese dialects in Malaysia.

As Khoo (2017, 2018) indicated, Malaysian Mandarin has some unique tonal variations, distinguishing it from other regional Mandarin varieties. The most noticeable difference is T4 being commonly produced as a high-level tone instead of a high falling tone when it occurs in polysyllabic words and the final position of utterance (Khoo, 2017). For example, "*kàn diànyǐng*" (watch movie) → *"kanˉ dianˉyingˇ"* and "*xiànzài*" (now) →*"xianˉzaiˉ"* (Khoo, 2018, p. 2251). Similarly, Yeoh (2019) analysed the pitch contour of T4, which appeared in different tonal combinations and positions of an utterance, and found that T4 pitch movement varies with the conditions above. The findings of these studies have described a phonetic phenomenon that T4 in Malaysian Mandarin is not stable in connected speech. However, how T4 varies and its relation with prosodic structure remain relatively unknown.

Two studies examined Mandarin T3 citation tone and sandhi tone in Malaysia. The findings by Huang (2016) and Khoo (2018) showed that the T3 citation tone is a low falling tone, not a dipping tone. For T3 in disyllabic words, Huang (2016) found that T3 changes to a low rising

tone when followed by another T3, while Khoo (2018) discovered no sandhi change in his study. These inconsistent findings may result from the difference in speakers and material for data collection. The former study collected data through a sentence read by younger speakers (below 40 years old) who were born and raised in Penang, on the northwest coast of Peninsular Malaysia. The latter study collected data through a disyllabic word reading and conversational interviews with older speakers (above 50 years old). They were born and raised in Kluang, a town in Johor, located south of Peninsular Malaysia. Undeniable, these two studies have partly described T3 of Malaysian Mandarin. But there is still a need to explore the T3 sandhi phenomena in Malaysian Mandarin, either the standard spoken variety or the colloquial spoken variety.

Apart from this, there are a few studies on the prosodic features of Malaysian Mandarin. Hlinka (2018) found that the duration distribution of disyllabic words in Malaysian Mandarin is similar to Standard Mandarin, while Kong (2019) and Yang and Chen (2016) have the opposite results. In a study by Lee (2017), the acoustic features of different prosodic boundaries in Malaysian Mandarin differ from Standard Mandarin. In the study by Chiew (2019), it was found that the perception of sentence focus by Chinese Malaysian is relevant to tonal categories. Overall, these studies hinted that prosodic features in connected speech are related to the lexical tone system. It is challenging to deliver a comprehensive analysis without considering the lexical tone.

In summary, there is a research chasm between lexical tone and prosody of Malaysian Mandarin. Generally, a study on prosodic features could not ignore the effect of lexical tone, while a study on lexical tone should not be merged with sandhi change in connected speech. Thus, the tone sandhi domain could be a joint unit of the base pitch contour and surface pitch contour. Similar to Malaysian English (Pillai, 2012, as cited in Pillai & Ong, 2018), the everyday spoken variety of Malaysian Mandarin is not homogeneous. It is not easy to give a concrete summary of its phonological features unless we sufficiently understand the standard spoken variety. For this reason, it is worthwhile to examine the T3 variation in the standard spoken form of Malaysian Mandarin as the Chinese academic has more understanding of the T3 sandhi phenomena.

3. METHOD

3.1 Participants

This study focused on the standard spoken form of Malaysian Mandarin as there was a lack of understanding of this spoken variety. There was a specific condition in recruiting participants to fulfil the research need. Referring to the model of Malaysian English varieties and Malaysian speakers of English (Ong, 2016, as cited in Pillai & Ong, 2018, p. 154), a standard variety speaker was mainly highly educated in a specific language. Since the local Chinese ethnic speakers were the main contributor to Malaysian Mandarin, this study recruited Chinese Malaysians who had completed 12 years of Chinese education and could use Mandarin in formal and informal situations. Forty-four Chinese Malaysian undergraduate students were recruited in this study, thirty-eight females and six males, aged 20-23 years old. All of them were major in Chinese language and linguistics at a public university in Malaysia and were able to use Mandarin fluently. Written informed consent was obtained from all participants in this research project. All of them were compensated financially for their participation in it.

The participants used different languages at home. As presented in Table 1, four of them mainly spoke Chinese dialects (such as Hokkien, Cantonese, Hakka, which are derived from the southern dialect in China) at home, twenty-nine of them mainly spoke Mandarin at home, eight

of them spoke Chinese dialects and Mandarin equivalent at home. In contrast, three of them spoke Mandarin/Chinese dialect and Malay/ English at home. Although the participants had various language backgrounds, the production of T3 sandhi and acoustic realisation were similar. Hence, this paper reported and discussed the finding based on the 44 participants as a group.

Table 1. Language Use Information of Participants

Main language(s) used at the home domain	Female	Male	Total
Chinese dialects (Hokkien, Cantonese, Hakka etc)	3	1	4
Mandarin Chinese	25	4	29
Chinese dialects and Mandarin Chinese	7	1	8
Mandarin Chinese/Chinese dialects and Malay/English	3	0	3
Total	38	6	44

3.2 Data Collection

A nursery rhyme *"上山找老虎"* (climb up the mountain to find a tiger) was used as reading material of this study (refer to Appendix). It was obtained from *"A beautiful reading of Chinese nursery rhymes"* (Wu, 2004), a book that provided prosodic information such as foot, stress, intonation and suggestion of reading. This nursery rhyme *"上山找老虎"* was selected because the prosodic structure is fixed and consists of nineteen T3 syllables (refer to the appendix, the Chinese characters and Pinyin in bold). There were eight lines in this rhyme, five-syllable for each line (utterance), and each utterance was divided into three feet (2 syllables + 2 syllables + 1 syllable).

All recording sessions were conducted in a soundproof room at the Universiti Malaya, Faculty of Languages and Linguistics. Zoom H6 handy audio recorder and a Sennheiser shotgun microphone were used for recording. The participants were seated about 15-20 cm from the microphone. During the recording, Audio-Technica ATH-ANC7B Headphones were used for monitoring. All data were recorded with a sampling rate of 44.1 kHz, 16-bit, mono.

The participants had five to six minutes to familiarise themselves with the reading material and recording environment before starting a recording session. The participants were reminded to read at their regular comfortable speech rate and as natural as possible. The participants were requested to read the rhyme twice. However, only the first reading was analysed in this study. It is to make sure the reading is produced naturally, and no post-self-correction happens.

3.3 Data Analysis

The annotation and data analysis was conducted using Praat (Boersma & Weenink, 2020), a free software package for speech analyses. Several relevant acoustic parameters for acoustic analysis of prosodic features include fundamental frequency (f0), duration, and intensity. No matter tone or intonation, the perception of the pitch has a close relationship with *f0*, the vibration rate of vocal folds (Beckman & Venditti, 2013). Hence, *f0* was the main acoustic parameter in this study to examine the pitch level and pitch contour of T3 syllables. Spectrographic analysis and auditory examination were carried out throughout the data analysis. A broadband spectrogram was used to determine the boundaries of the syllabic rhyme and voice quality, while a narrowband spectrogram was used to analyse the pitch level and contour.

By referring to the spectrogram and auditory perception, the acoustic realisation of each T3 syllable was analysed as follows: firstly, pitch level: high (H), mid (M) or low (L); secondly, pitch contour: falling, level, rising, falling-level, or level-rising; third and lastly, voice quality: normal or creaky voice. The labelling of pitch level was based on the pitch height of each utterance and pitch range of a participant. The pitch contour of a T3 syllable was compared with the neighbouring syllable and auditory justification before determining the pitch level (H, M or L). For pitch contour, if the pitch changes on the rhyme of syllable (whether rising or falling) was less than 20 Hz, it was labelled as level. The labelling of voice quality was necessary for T3 variation. The creaky voice was associated with an extra-low $f0$ frequently occurred in T3 production as T3 is a lexical tone with a low pitch target. Besides that, a creaky voice also contributed to the perception of Mandarin lexical tone (Huang, 2019; Kuang, 2018). Therefore, the voice quality of T3 was as important as pitch features in this study.

4. RESULTS

The result showed that not all T3 which was followed by another T3, underwent a tonal change. Implementation of the T3 sandhi rule is relevant to the number of T3 syllables and the position of T3 in an utterance. Therefore, a T3 will be addressed as "sandhi form" (SF) or "citation form" (CF) in this section, which refers to sandhi tone occurring or retaining of the underlying tone. The frequency of T3 tonal variation will be explained first, followed by the reports of acoustic realisation of T3 sandhi form and citation form in the utterances. Descriptive statistics and spectrogram of sample data were used to present the findings of this study.

4.1 Implementation of Third Tone Sandhi Rule

Figure 1 presents the tonal variation of T3 of the current study. Suppose a T3 is followed by one T3 syllable, which is a disyllabic T3 sequence. The results are shown under the labels of "1", "2a", 2b(i)" and "2b(ii)". Meanwhile, if a T3 is followed by two T3 syllables, which is trisyllabic T3 sequence, the results are shown under the labels of "3a & 3b". In addition, the labels "a" and "b" represent the prosodic structure, particularly the rhythmic unit of Standard Chinese; "a" refers to a T3 sequence within a foot, "b" refers to a T3 sequence across two feet.

When disyllabic T3 sequence appeared within a word such as "老虎" (tiger), the frequency of change to sandhi form is 94.3% (refer to data "1"). If the sequence appeared across two words, the frequency of change is related to the foot, the rhythmic unit. If it is within a foot "[3-3]" such as "|有几|" (have how many), the frequency of change is 100% (refer to data "2a"). If it is across two feet "[x-3][3-x]", the syntactic and rhythmic relation affects it. For T3 sequence with close syntactic and rhythmic relation such as "我|数" (I count), refer to data "2b(i)", the tone sandhi is more than 90%. For T3 sequence with looser syntactic and rhythmic relation such as "虎|找" (tiger to find), refer to data "2b(ii)", the frequency of change and retention is almost half for both.

For the trisyllabic T3 sequence, the result is consistent. Sandhi Tone in Standard Chinese is leftward spreading, meaning the tonal variation starts from the right to the left. The second T3 syllable prioritises changing to sandhi form, while the initial T3 can only retain as citation form as it loses the condition for sandhi tone. It is the same even if the previous two T3 is within a foot "[**3-3**][3]" (refer to data "3a" in Figure 1) or across two feet "[x-**3**][**3**-3]" (refer data "3b" in Figure 1). Therefore, for data "3a and 3b", the frequency of initial T3 changed to sandhi form is 2.3% and retained as low tone is 97.7%.
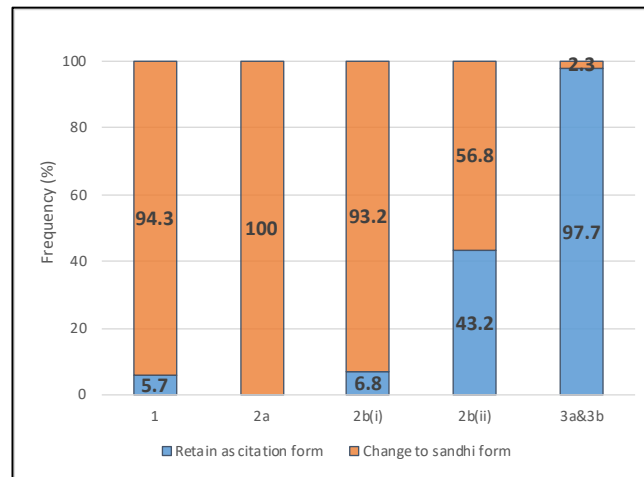
Figure 1. Tonal variation of T3 in Malaysian Mandarin

4.2 Acoustic Realisation of T3 Sandhi Form

The pitch features (pitch level and pitch contour) of the T3 sandhi form are shown in Figure 2. As reported before, only the initial T3 in the disyllabic T3 sequence will undergo tone sandhi. For T3 within a word and also within a foot (data "SF-1" and "SF-2a"), more than 95% is realised as a high rising or high level-rising tone. For T3 across two feet, the frequency of high rising or high level-rising tone is decreased while the frequency of the mid-level tone is increased. This phenomenon is evident when the syntactic and rhythmic relation of a T3 sequence is looser; 28% of participants produced sandhi form as mid-level tone (data "SF-2b(ii)").

Figure 3 presents two sample data of the third utterance (line 3) of the rhyme. The syntactic and rhythmic relation between the second syllable "12 虎" and following T3 is looser. Hence, there are two possible realisation sandhi forms, high level-rising tone and mid-level tone (refer to the pitch contour between two dash lines in the picture "(a)" and "(b)"). Besides, Figure 3 also shows that T3 sandhi within a word is very stable and not affected by the leftward spreading rule. The first syllable, "11 老" must be joined with the second syllable for a full lexical meaning ("老虎" tiger of the data "1"); therefore, it is changed to a rising tone without referring to the neighbouring condition.
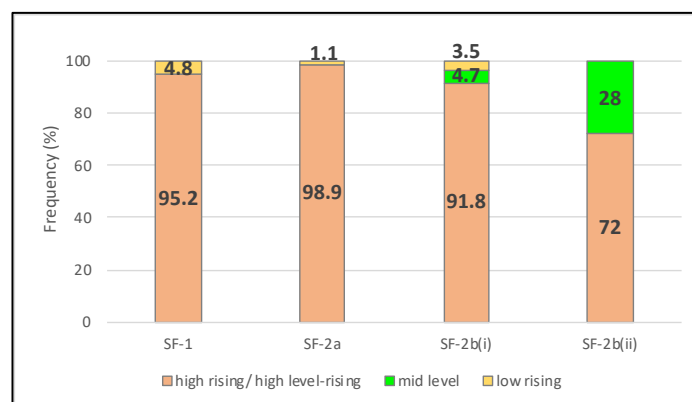
Figure 2. The acoustic realisation of T3 sandhi form in Malaysian Mandarin

8
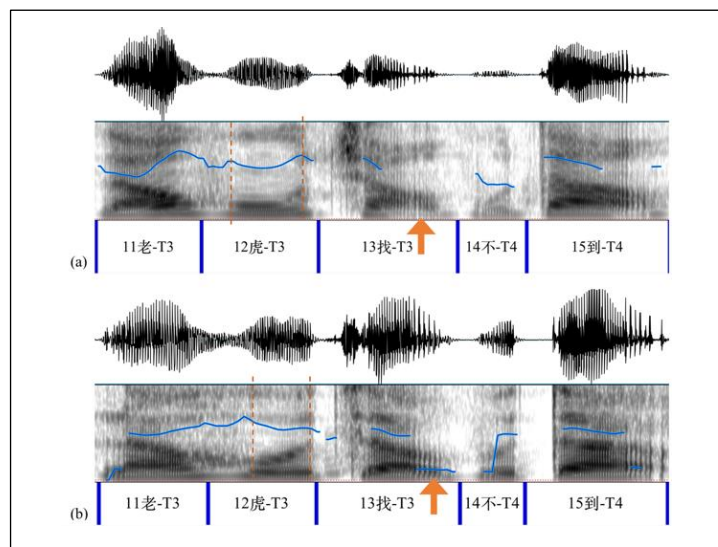
Figure 3. Two sample data of T3 sandhi form which has looser syntactic and rhythmic relation (across two feet) in waveform and spectrogram

4.3 Acoustic Realisation of T3 Citation Form

T3 followed by non-T3 syllable and T3 in the final position are retained as citation form, which is a low pitch target. However, the realisation of the T3 citation form in the non-final position and final position of utterance shows some differences, mostly at the non-final position and final position of utterance, mainly in voice quality.

As shown in Figure 4, there are two main realisation types of T3 citation form that includes low a falling, low-level tone with normal phonation and low falling, low-level tone with creaky voice. Both realisation types applied on T3 of non-final position (data *"CF-nf"*) and T3 of final position (data *"CF-f1"* and *"CF-f2"*) with different frequency. The occurrence of normal phonation is reduced from a non-final position (data *"CF-nf"*) to final position (data *"CF-f"*), from 61.7% dropping to 9.2%. The creaky voice of T3 in the final position increases if it is located closer to the end of the nursery rhyme. The data *"CF-f1"* to *"CF-f2"* have shown the trend of increasing T3 realisation with creaky voice, from 70.3% to 90.8%.

For T3 citation forms in disyllabic and trisyllabic T3 sequences, the realisation differs based on its position in a rhythmic unit. If the first two T3 syllables are within a foot, the occurrence of normal phonation and creaky voice is nearly half and a half (data *"CF-3a"*). If these T3 syllables are across two feet, the occurrence of normal phonation is more than 84%, which is much higher than the realisation with creaky voice (data *"CF-3b"* and *"CF-2b(ii)"*).
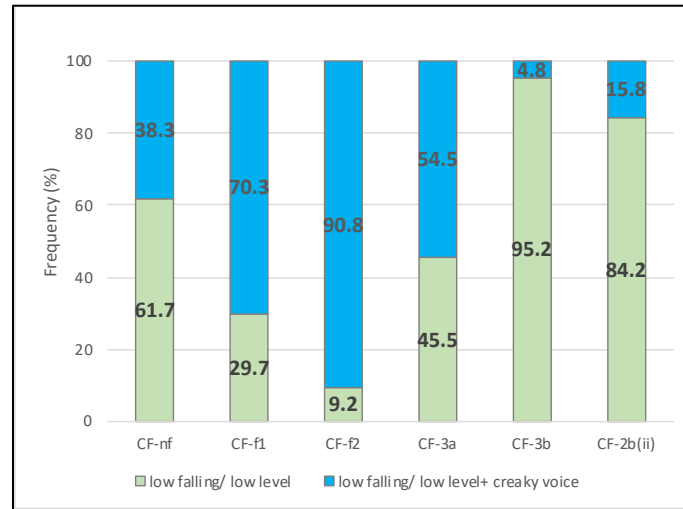
Figure 4. The acoustic realisation of T3 citation form in Malaysian Mandarin

There are not many differences in the quality of creaky voice in non-final and final positions. However, the quality of creaky voice varies from one individual to another. Some female participants produced much lower pitch than male participants. Nevertheless, females and males do not differ in how they use creaky voices in T3 syllables. The irregular glottal pulse may occur at the last 30%-40% portion of a rhyme as in Figure 3 and Figure 5 (indicated with an upper arrow). It may also occur almost throughout a rhyme, such as in Figure 6 (indicated with an upper arrow). Besides, there was an interesting finding in the creaky voice and tone category; a creaky voice of the non-final position mainly occurs on the T3 syllable. In contrast, a creaky voice of the final position occurs on the T3 and T4 syllables (refer to the spectrogram of "15 到" in Figure 3, a sample data of creaky voice on the T4 syllable).
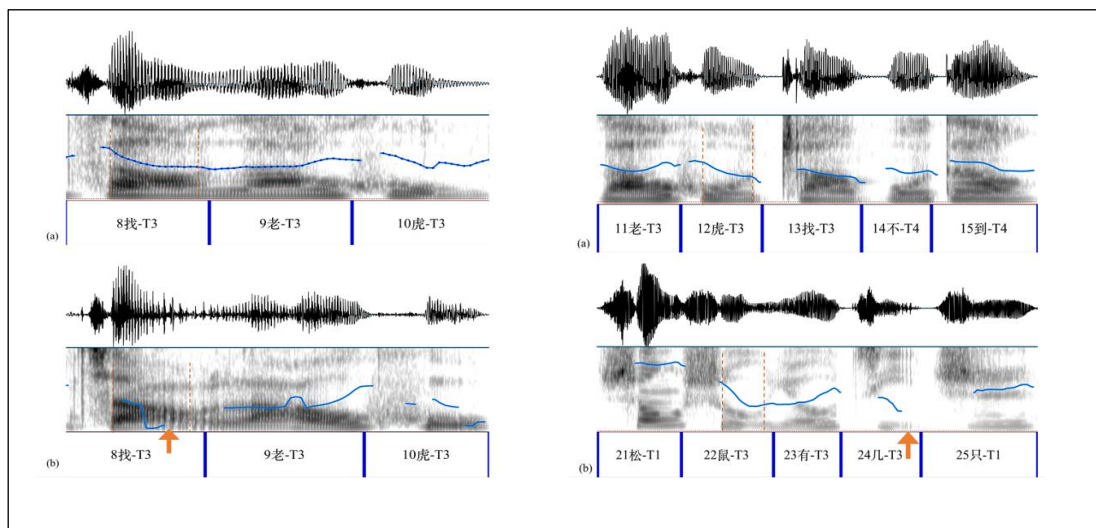
Figure 5. Sample data of T3 citation form which has looser syntactic and rhythmic relation
(left: within a foot; right: across two feet) in waveform and spectrogram
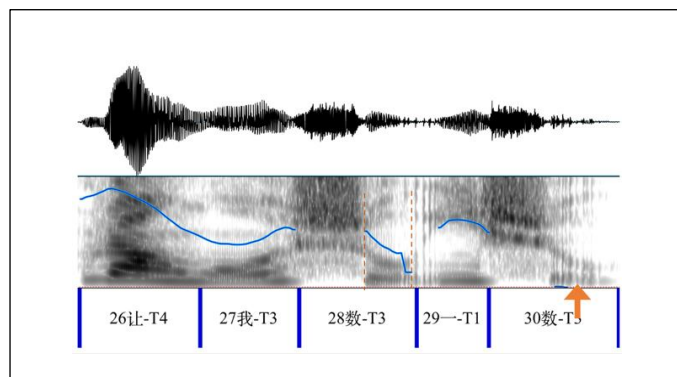
Figure 6. Sample data of T3 citation form at the final position in waveform and spectrogram

5. DISCUSSION AND CONCLUSION

By conducting analyses of both acoustic and descriptive statistics, the acoustic realisation of T3 in a nursery rhythm was examined. This study found that, generally, the T3 sandhi phenomena in the standard spoken form of Malaysian Mandarin matched the sandhi rule of Standard Chinese in this study. However, not all preceding T3 before another T3 will undergo sandhi change. It is constrained by a rhythmic unit's position and the syntactic and rhythmic relation within a T3 sequence. Sandhi change within a T3 disyllabic word is the most stable combination which is not affected by the neighbouring tonal condition and rhythmic unit. If a T3 sequence occurs across a word but within a foot, the result is similar to the T3 disyllabic word. If a T3 sequence occurs across two feet, the syntactic and rhythmic structure affects the T3 implementation. A T3 tends to sandhi change if the syntactic and rhythmic relation of the T3 sequence is tight; otherwise, a T3 tends to remain a low tone if this relation is loose. The acoustic realisation of the T3 sandhi form also varies when a T3 sequence occurs within or across two feet. High raising or high level-rising tone is the typical realisation of T3 sandhi form. In contrast, the mid-level tone is an atypical realisation that predominantly appears in the T3 sequence across two feet with a looser syntactic and rhythmic relation. On the other side, all T3 syllables retained the underlying tone in the utterances when preceding non-T3, and it is located in the final position. The T3 citation form is fixed as realised as low falling or low-level tone. Besides of low pitch target, a creaky voice frequently occurs at the T3 syllable in the non-final and final position. The creaky voice could be identified as the realisation of the T3 low pitch target and the boundary mark of a larger prosodic hierarchy (Kuang, 2018).

The pitch movement in a Mandarin utterance is non-linear. It results from superimposing the underlying tone, lexical tone, the underlying tone, lexical tone, and surface tone, which is intonation (Duanmu, 2007). This paper has initially confirmed the effect of prosodic and syntactic factors on the realisation of T3 in an utterance. In other words, the T3 sandhi is not a "pure" phonetic change in Malaysian Mandarin, which is similar to Standard Mandarin (Wang et al., 2018). The high occurrence of creaky voice and non-consistent realisation of the T3 sequence across two feet may hint that tone sandhi domain in Malaysian Mandarin, particularly the standard spoken variety, may not equate to Standard Mandarin. The tone sandhi domain is the fundamental unit of rhythmic structure (Chen, 2000). It is also a suitable interface for conducting a systematic phonetic study on Malaysian Mandarin. By investigating sandhi change, the previous scattered findings on tone realisation and prosodic structure could be integrated to provide a better understanding of Malaysian Mandarin, especially on the phonetic and phonology system.

A nursery rhythm has a fixed prosodic structure and limited syntactic categories, which is easier to analyse. However, it is not equivalent to an actual speech, and at the same time, it may not

be sufficient to discover the tone sandhi domain of a Mandarin variety. To further explore the T3 sandhi domain and the rhythmic structure of the standard spoken form of Malaysian Mandarin, it is recommended to use different spoken contexts such as paragraph reading and semi-spontaneous speech in future studies.

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APPENDIX

Appendix 1: Reading material

Line 1   一二 三四 五，   *"One two three four five"*

        yī èr sān sì **wǔ**

Line 2   上山 **找老** 虎，   *"Go up the mountain to find a tiger"*

        shàng shān **zhǎo lǎohǔ**

Line 3   **老虎 找**不 到。   *"A tiger could not be found"*

        lǎohǔ zhǎo bú dào

Line 4   **找**到 **小松** 鼠；   *"Find the little squirrel"*

        zhǎo dào **xiǎo** sōng**shǔ**

Line 5   **松鼠 有几** 只?   *"How many squirrels are there?"*

        sōng**shǔ yǒu jǐ** zhī

Line 6   让**我 数**一 **数**；   *"Let me count"*

        ràng **wǒ shǔ** yī **shǔ**

Line 7   **数**来 又**数** 去，   *"Counting and counting"*

        shǔ lái yòu **shǔ** qù

Line 8   一二 三四 五。   *"One two three four five"*

        yī èr sān sì **wǔ**.

AUTHOR BIOGRAPHY

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Facilitator's Scaffolding Strategies in a Design-based Learning Context

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ABSTRACT

Design-based learning (DBL) is a pedagogy grounded in inquiry towards generating artefacts to solve a real-life issue through an iterative engineering design process. Completing a design task is challenging. Scaffolding is necessary for supporting student learning in a DBL context. However, a review of the literature revealed that there are still significant implementation issues related to scaffolding student learning in this context. The roles played by facilitators in scaffolding student learning in a DBL context are also under-researched. This study aimed to investigate facilitator's scaffolding strategies which could be used to help students integrate knowledge in a DBL context. This study involved a class of 27 Form 1 students in a national school. The students learned how to integrate knowledge from Science, Technology, Engineering, Arts and Mathematics (STEAM) subjects to design and construct a water filter. They were scaffolded by the facilitator throughout the implementation of this design task. Video recordings, student interviews and researcher's notes were used for data collection. Several vignettes were presented to illustrate how these scaffolding strategies were used to help students integrate knowledge. The research findings showed that the facilitator used various types of scaffolding strategies to support student learning based on their emerging learning needs. The scaffolding strategies were categorised into six types in terms of cognitive, linguistic, metacognitive, motivational, social, and strategic scaffolding. This study highlighted how multiple facilitator's scaffolding strategies could work as a system to help students develop a coherent understanding of the design task. This study provides guidance for teachers in pre-designing scaffolding into their instructional practice. This study also opens new lines of research which establish connections between application of scaffolding knowledge integration and interdisplinary learning context.

1. INTRODUCTION

Scaffolding refers to temporary support provided by more capable individuals to help students move progressively towards independent learning (Maybin, Mercer, & Stierer, 1992). Two broad categories of scaffolds are fixed and adaptive scaffolds (Azevedo, Cromley, Winters, Moos, & Greene, 2005) or hard and soft scaffolds (Saye & Brush, 2002). Hard or fixed scaffolds are static support planned in advance of implementing a lesson (Azevedo et al., 2005; Saye & Brush, 2002). Soft or adaptive scaffolds are dynamic and situational support provided to students based on their progressive development in learning (Azevedo et al., 2005; Saye & Brush, 2002). Adaptive scaffolds are essential in a constructivist learning environment, such as design-based learning (DBL) (English, 2016; Puente, Eijck, & Jochems, 2013a, 2013b).

However, in the research on DBL, the roles played by facilitators are not well researched (Puente, Eijck, & Jochems, 2013a). A synthesis of the existing literature shows that facilitators use six main types of scaffoldings to support student learning: cognitive, linguistic, metacognitive, motivational, strategic, and social scaffolding (Belland, 2017; Belland, Kim, & Hannafin, 2013; Baxter & Williams, 2010; Smit & Eerde, 2013). Yet, there is a lack of research in identifying how facilitators can adopt these different types of scaffoldings in a DBL classroom (Puente et al., 2013a). Furthermore, there are still many open questions about how different types of teacher's scaffolding strategies interact and work as a system to support student learning. This study aimed to close these research gaps by exploring facilitators' scaffolding strategies to help students integrate knowledge in a DBL context.

This study has practical implications on teaching and learning. It can extend facilitators' understanding of students' different learning needs in constructivist learning environments such as DBL. This study can also help facilitators plan different types of scaffolding strategies to cater to their students' diverse learning needs to explore their investigation path. Besides, the research findings can provide an insight into how different scaffolding strategies work synergistically to support student learning in a DBL context.

2. LITERATURE REVIEW

2.1 Types of Scaffoldings

Research on scaffolding student learning in inquiry-based learning environments divided scaffolding into six main types: cognitive, linguistic, metacognitive, motivational, strategic, and social scaffolding (Belland, 2017; Belland, Kim, & Hannafin, 2013; Baxter & Williams, 2010; Smit & Eerde, 2013). Making a distinction between different types of scaffolding does not mean that scaffolding strategies fall neatly into one specific category. Indeed, researchers recognise that students need scaffolding from the cognitive, language, social, and emotional aspects. Cognitive scaffolding helps students construct cognitive structures such as identifying evidence, analysing and interpreting data and, justifying the proposed solution (Baxter & Williams, 2010). It also helps students focus on *"things to consider"* (Belland, 2017, p. 109) when they solve a problem. Cognitive strategies such as highlighting critical features (Baumgartner & Reiser, 1998; Penner, Lehrer, & Schauble, 1998), providing hints (Cunningham & Lachapelle, 2016; Penner et al., 1998) and, unpacking scientific knowledge underlying a design solution can help students narrow down alternatives to focus on a more productive solution (Hmelo, Holton, & Kolodner, 2000). Linguistic scaffolding helps students achieve desired academic language output (Smit & Eerde, 2011). For instance, facilitators help students use correct scientific terminology to explain their design solutions (Puente et al.,

2013a), restate their correct utterances and, reformulate their answers using precise terms (Smit & Eerde, 2013).

Metacognitive scaffolding helps students self-reflect on their knowledge and skills and monitor their progress (Belland, 2017). Asking reflective questions (Hmelo et al., 2000; Penner et al., 1998) can trigger students to reflect on their design solutions. Motivational scaffolding triggers students' interest and enhances their motivation to keep them engaged in the activities (Belland, Kim, & Hannafin, 2013). This can be achieved by giving students autonomy to make design decisions (Puntambekar & Kolodner, 2005), developing a shared task goal, and establishing task value (Belland et al., 2013; Puntambekar & Kolodner, 2005). These strategies can develop students' ownership of a design task (Belland et al., 2013).

Learning in a DBL context is collaborative in nature (Puente et al., 2013b). Social spaces allow students to share ideas with their peers and support or rebut each other's ideas to co-construct knowledge (Puntambekar & Kolodner, 2005). Thus, social scaffolding is necessary to guide students to work with each other (Baxter & Williams, 2010). Teachers need to highlight group rules or bootstrap collaborative learning skills to help students work with their peers (Baxter & Williams, 2010). Strategic scaffolding suggests strategies or processes students can use to solve a design task (Belland, 2017). This strategy opens an opportunity for students to apply their knowledge, revise and modify their plans based on feedback received for better outcomes (Belland, 2017).

Some studies have investigated facilitator's scaffolding strategies in light of a particular type of scaffolding. For instance, Mackiewicz and Thompson (2014) reported that the tutors in their study used motivational scaffoldings such as reinforcing student's ownership and control over their work, using humour, and showing empathy towards their students' unpleasant learning experience. In terms of cognitive scaffolding, the tutors read aloud the students' drafts, linked new knowledge to a prior topic, prompted and hinted at the students (Mackiewicz & Thompson, 2014). In a research that explored social scaffolding, Baxter and Williams (2010) found that teachers used questions to invite responses from the students and encourage them to look for alternative solutions during whole-class discussions. However, research into the six aforementioned scaffoldings and how they work together to support learning is scarce. In this study, we examined how the facilitator scaffolded learning using different scaffolding strategies that were chosen based on the student's emerging learning needs in a DBL environment.

2.2 Scaffolding Design-based Learning

Design-based learning (DBL) is an instructional approach in which students solve ill-structured, real-life issues through an iterative cycle of the engineering design process (English & King, 2015; Puente et al., 2013b). The design processes involve identifying design problems, designing, testing, justifying, and redesigning a design solution (English & King, 2015; Puente et al., 2013b; Puntambekar & Kolodner, 2005). DBL emphasises making connections between design activities, concrete artefacts, and relevant conceptual knowledge (English & King, 2015). However, students tend to treat DBL tasks as craft activities and pay less attention to the concepts underlying their designed artefacts (Puntambekar & Kolodner, 2005). For example, Berland, Steingut, and Ko (2014) found that students could suggest multiple solutions for designing and refining their designs, but they did not associate them with disciplinary knowledge. Students also face many challenges such as obtaining unexpected design outcomes, misinterpreting data and, identifying imprecise variables which affect their results (Baumgartner & Reiser, 1998). DBL can only become a productive context for student learning if appropriate facilitator scaffolds are provided to them (English & King, 2015; Hmelo et al.,

2000; Puente et al., 2013a, 2013b; Puntambekar & Kolodner, 2005). For instance, the students in the research by Puntambekar and Kolodner (2005) were able to develop scientific reasoning and argumentations when they were involved in designing a solution to solve a real-world corrosion issue, with the support from hard scaffolds (i.e., written prompts) and facilitators. In a study by Hmelo et al. (2015), young students were able to learn the complex scientific ideas about the respiratory system as they were constructing an artefact resembling human lungs with support from the facilitator.

Previous studies have indicated that facilitators play a pivotal role in supporting student learning in a DBL learning context (Penner et al., 1998; Puente et al., 2013a; Puntambekar & Kolodner, 2005). Scaffolding maximises the full affordances of DBL for fostering students' knowledge construction, metacognition skills, and scientific reasoning (Puntambekar & Kolodner, 2005). For example, facilitators ask appropriate questions to help students notice and connect knowledge from multiple disciplines to develop a design solution (English & King, 2015; Hmelo et al., 2000; Penner et al., 1998). Facilitators also stimulate students' inventive thinking by focusing their attention on main design issues and making connections between various design stages (Baumgartner & Reiser, 1998; Puntambekar & Kolodner, 2005).

Hmelo et al. (2000) designed a study to support sixth graders' understanding of the complex human respiratory system by constructing a working model of an artificial lung. Hmelo et al. (2000) recommended a few strategies to enhance students' knowledge and systematic thinking in designing artefacts. These strategies include introducing scientific terminology explicitly to develop early causal mechanisms; conducting reflective discussions and whole-class discussions seamlessly to promote idea-sharing and self-reflection; planning and structuring activities based on a time constraint and available resources; providing timely feedback; and connecting new tasks to students' prior knowledge (Hmelo et al., 2000). Puente et al. (2013a) elaborated that facilitators encouraged students to formulate arguments and explore alternative solutions for a design problem by asking reflective questions.

Puntambekar and Kolodner (2005) argued that planning whole-class discussions and small group discussions at appropriate intervals for idea articulation are necessary to unpack students' design ideas. They also suggested other strategies to facilitate student learning during DBL, such as chunking complex tasks into more manageable pieces, providing suggestions to help students focus on important knowledge and eliciting information to make connections between different design stages more explicit. Students also need help from facilitators to conduct good experiments for testing prototypes and justify results for emergent learning problems (Baumgartner & Reiser, 1998). Besides, facilitators problematised students' designs to help them revise their conceptual understanding of a subject area (Morgan, Moon & Barroso, 2013; Puente et al., 2013a). Problematising student work can further develop students' ability to solve a problem (Reiser, 2004). Through this strategy, students focus their attention on an aspect that needs a solution and learns to elicit their ideas (Reiser, 2004).

3. METHODOLOGY

3.1 Participant

The first author of this study played the role of the facilitator in the DBL context. The first author has 10 years of experience in teaching secondary school science in Malaysia and Brunei Darussalam.

3.2 Research Context

In this study, the facilitator implemented a DBL task with a class of Form 1 students from a Malaysian national school located in the suburban area in Johor state. There were 27 students of different ethnicities in this class. Among these students, 14 were male. The students were randomly divided into a group of three students, forming nine student groups (Group A to Group I). This is the minimum number required for a small group discussion (University of Minnesota, 2021). It is also a good number for a small team to prototype a new idea (Corrigan, 2021).

This DBL cycle was divided into 16 one-hour lessons. A real-life design task drove the DBL challenge (English & King, 2015). The DBL lessons focused on designing and constructing a water filter that could provide clean water to villagers inhabiting remote areas based on the design criteria (i.e., filter 100ml water in two minutes, produce clear water, economic). The students were required to use knowledge from STEAM (Science, Technology, Engineering, Arts and Mathematics) subjects to solve this design task in groups.
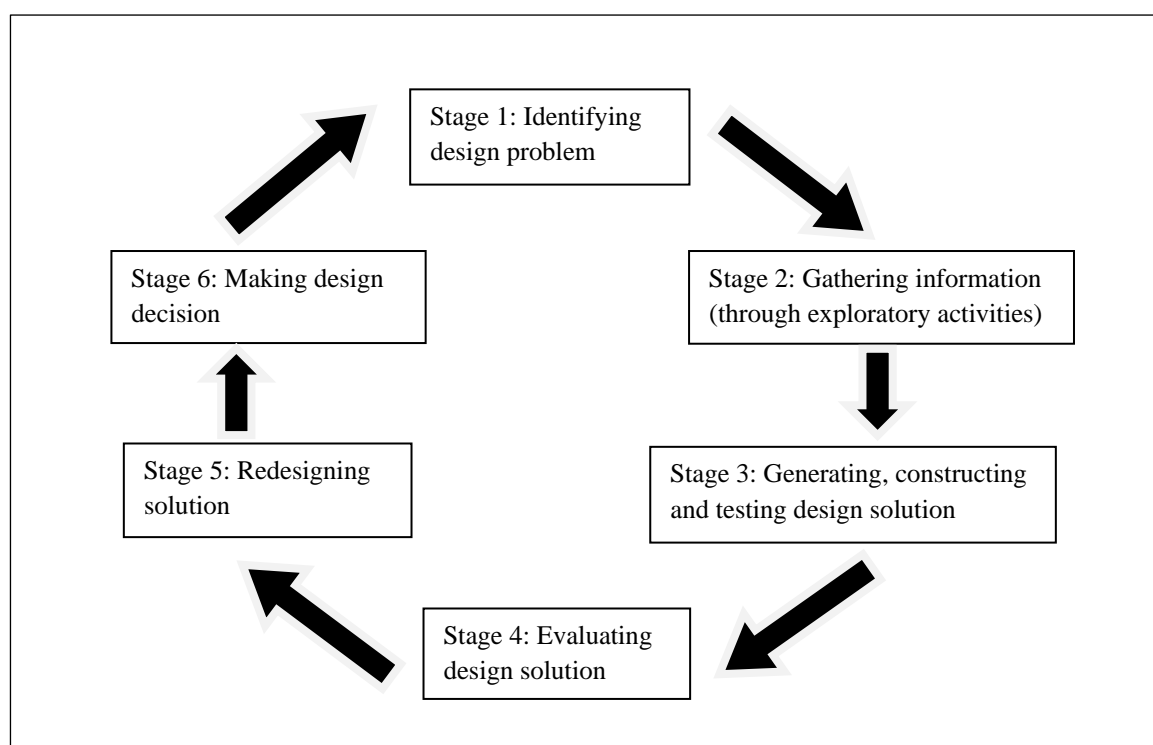
Figure 1. The Design-based Learning Cycle. Adapted from Hynes et al. (2011) and Puntambekar and Kolodner (2005)

The pedagogical framework of DBL was modified from the previous studies (Hynes et al., 2011; Puntambekar & Kolodner, 2005). As shown in Figure 1, the DBL cycle was divided into six major design stages: identifying design problem, gathering information, generating, constructing, and testing design solution, evaluating design solution, redesigning solution, and making a design decision. The problem identification stage gave the students time to analyse and define the learning issues and design problems using their prior knowledge. The information-gathering stage was for the groups to explore the nature of different types of filtering and discuss the experimental results before designing a prototype. At the stage of solution generation, the students were required to complete four tasks: selecting and justifying filtering materials, deciding the arrangement materials, identifying the concepts involved in the

design of the water filter and drawing a pictorial diagram for their design solutions. During the evaluation stage, students shared their findings from the design activities, listened, and provided feedback to their peers for design improvement. The redesign stage was for the students to integrate knowledge and apply what they had learned from their initial design to improve their second artefacts. At the final stage of making a design solution, the students were required to compare their initial and redesigned solutions and justify their design solutions. Each group was also provided with a worksheet containing some question prompts at each design stage.

3.3 Data Collection and Analysis

Data was collected from video recordings and student interviews. Each activity was videotaped to preserve the moments involving the scaffolding process. During whole-class discussions, a camera was placed at the back of the class to record the interactions between the facilitator and the students. A camera was pointed to the facilitator and the scaffolded groups to capture the scaffolding strategies during small group discussions. The rationale was to identify the scaffolding strategies adopted by the facilitator in response to the emerging learning needs of each student group.

Data analysis of the video recordings involved three steps: selecting critical incidents, transcribing and coding video recordings, and categorising the codes to identify facilitator scaffolds. First, critical incidents that emerged over several lessons were identified. A critical incident is "any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act" (Flanagan, 1954, p. 327). It is useful for identifying crucial factors that affect a defined purpose's outcomes (Flanagan, 1954). The criterion for selecting a critical case in this study was: a case that helped the researcher gain insights into different types of scaffolds adopted by the facilitator in the DBL context. Second, the critical incidents were transcribed verbatim and coded. While there was no a priori coding scheme for the data, coding was primarily guided by the existing literature discussed in the literature review section. Third, a constant comparative method was used to categorise the codes, delineate the categories and make connections between them (Lincoln & Guba, 1985). Categories were created when the researcher grouped and clustered relevant codes together (Lincoln & Guba, 1985). Those categories changed the units of data were constantly compared and categorised to identify any emerging category relevant to the research objectives.

To ensure the trustworthiness of the research, the data were coded by two coders. The first author was one of the coders. The second coder is an academic at a US-based university with no direct involvement with this study other than a coder and peer debriefer. First, the two individuals coded the data separately. Then, the codes were reviewed and revised based on the consensus of the coders.

4. FINDINGS

Table 1 summarises the scaffolding strategies adopted throughout the implementation of DBL activities. We categorise the facilitator's scaffolding strategies into six types of scaffoldings: cognitive, linguistic, metacognitive, motivational, strategic, and social scaffolding.

Table 1. A Summary of Facilitator's Scaffolding Strategies

Scaffolding types	Scaffolding strategies	Description
Cognitive scaffolding	• Linking to prior knowledge	• Relate students' existing experiences/ knowledge/ previous investigations to the current task
	• Questioning and pushing for an explanation	• Ask what students know about a topic, their design ideas or next step; and prompt them to give a deeper explanation
	• Appropriating and recasting	• Restate students' ideas and build these ideas into facilitators' scaffolding discourses
	• Modelling	• Set an example for imitation
	• Summarising	• Recap the main points of discussion
Linguistic scaffolding	• Reformulating using precise scientific terms	• Correct students' statements using precise academic wording
Metacognitive scaffolding	• Thinking aloud	• Prompt students to reflect on their learning by speaking out their ideas
Motivational scaffolding	• Promoting success expectancy	• Enhance students' belief in success
Social scaffolding	• Creating social spaces	• Create opportunity for students to share ideas at the whole class or small group level
	• Highlighting group rules	• Make the importance of working as a team explicit to students
Strategic scaffolding	• Contrasting cases	• Compare and contrast multiple design solutions
	• Peer reviewing	• Take advantage of neighbouring students to critique a group design solution

4.1 Cognitive Scaffolding

The cognitive scaffolding strategies, which emerged from the data, were linking to prior knowledge, questioning and pushing for an explanation, appropriating and recasting, modelling, and summarising.

4.1.1 Linking to Prior Knowledge

The facilitator's scaffolding strategies were explicitly grounded in the students' prior experiences. She made references to the students' out-of-class and in-class experiences to locate the new learning issue within their existing mental schemata. An example of this scaffolding strategy can be seen in the following scenario when the students linked the design criteria with relevant core concepts from STEAM classes:

> [1]*Facilitator: We had discussed the five design criteria for the water filter yesterday. Can you name one of these criteria?*
>
> [1]*Student: We need to filter 500ml of water as fast as possible.*
>
> [2]*Facilitator: That's right. Can you relate this criterion to the science or mathematics concepts which you have learned in class?*
>
> [2]*Student: Volume and time.*
>
> [3]*Student: Filtration and filtering materials.*
>
> [3]*Facilitator: In short, each design criterion is related to some core concepts from the STEAM subjects. You are expected to apply your prior knowledge from these subjects to solve the task.*

This short exchange occurred at the beginning of the lesson. The facilitator helped the students recall the design criteria discussed in the previous lesson ([1]Facilitator and [2]Facilitator). This starting point enabled the facilitator to link the students' prior knowledge with the new learning objective to make it more accessible to the students.

For example, during the interviews, two students explained that *"At first, it was hard for me to understand how to link the concepts from different subjects. After the facilitator asked us to name some concepts from STEM subjects, I knew that those concepts could be linked."* and *"When the facilitator made us see that we could use our existing knowledge from science, arts and mathematics to design a filter, we felt more confident to complete the job."*

4.1.2 Questioning and Pushing for an Explanation

The facilitator frequently questioned and pushed the students for an explanation. An example can be seen when two students, Eiden and Eason, explained how their group arranged the filtering materials:

> [1]*Eiden: First, we arrange cotton, followed by carbon, gravels, coarse sand and fine sand.*
>
> [1]*Facilitator: Why do you arrange the materials in such a way?*
>
> [2]*Eiden: Our idea is to use cotton and carbon on the top layer to filter out the suspension so that clearer water can be produced. But cotton may cause the water to flow slowly, so we arrange gravel with a larger size on the third layer to make the water flows faster.*
>
> [2]*Facilitator: How about the coarse sand and fine sand?*
>
> [1]*Eason: The size of the materials decreases from gravel to coarse sand and fine sand. This can help filter out small size substances.*

Eiden made his thinking visible to the facilitator ([1]Eiden) by explaining his design ideas. This allowed the facilitator to gain an understanding of the students' ability to justify their solutions. The facilitator pushed the students to explain further the arrangement of different filtering materials ([1]Facilitator and [2]Facilitator). The students could link their design solution to the characteristics of the filtering materials such as water absorber, substances size ([2]Eiden) and space ([1]Eason). The facilitator never evaluated the students' responses but provided a chance for them to articulate their ideas. This set the ground for the students to investigate the outcomes of their design solution in the following DBL stages.

During the interview, the students explained that questioning and pushing for explanation stimulated their thinking. For example, they said, *"The facilitator asked many questions to trigger our ideas."* and *"When the facilitator asked questions, I started to think. Sometimes my answers were incomplete, when she asked more questions, I could add more detailed explanations."*

4.1.3. Appropriating and Recasting

Within a whole class discussion, the students were encouraged to make their thinking public. However, a variety of ideas contributed by different students were scattered around the classroom. Appropriating or uptake occurred when the facilitator took up the students' ideas and built their contributions into her scaffolding discourses. Appropriating was normally followed by revoicing, or in other terms, recasting or restating, to shape the students' knowledge. One of the examples took place when the students were identifying the causes of clean water shortage:

[1]Facilitator: Why does this problem (clean water shortage issue) happen? You may use your knowledge gained from geography lessons or general knowledge to answer this question.

[2]Student: The number of people increases.

[2]Facilitator: When the population increases, there will be rapid development. We need land to build more housing areas. How do we get land?

[2]Student: By cutting down trees in forests.

[3]Facilitator: Cutting down trees brings a lot of disadvantages to both living things and the environment. Can you name the negative impact?

[3]Student: It causes soil erosion.

[4]Student: There will be a lack of clean water.

[4]Facilitator: There is a connection between what both of you have said. Eroded soil may be carried by rainwater into rivers and make the water milky and muddy.

The facilitator prompted the students to use the knowledge gained from their formal learning or real-life experiences to identify the factors leading to clean water shortage ([1]Facilitator). She constantly restated the students' ideas such as *"population increases"* ([1]Student) and *"cut down trees"* ([2]Student) and built their discourses into her next line of elaboration to help them focus on the main learning issue. When two students provided different opinions, stating that deforestation caused erosion ([3]Student) and clean water problem ([4]Student), she pieced their fragmented ideas together by explaining how corroded land might cause the issue of murky water ([4]Facilitator). The students' contributions of ideas were appropriated into the scaffolding discourses. They became co-participants in the construction of a broader and more systematic codification of integrated ideas.

4.1.4. Modelling

Modelling was used to introduce the new DBL approaches, concepts or, skills to the novice. This strategy set an example for imitation to help the students apply the appropriate knowledge and skills to solve the design problem. In the following example, the facilitator demonstrated the appropriate way to select a filtering material:

[1]Facilitator: You must always keep the five design criteria in your mind when you select a filtering material. Let's take fine sand as an example. First, we check its cost in the price list (provided by the facilitator). How much does it cost?

[1]Student: RM2.50.

[2]Facilitator: Next, can you relate fine sand with water clarity?

[2]Student: The spaces between the fine sand are small so that it can produce cleaner water.

[3]Facilitator: Right. But choosing fine sand may have some disadvantages.

[3]Student: I think the filtering time will become longer.

[4]Facilitator: That's a good answer. Can you check the experimental results collected from the previous activities? Tell me how much time was used to filter 100ml of water.

[4]Student: It took 840 seconds.

The facilitator modelled how to use the price list as a reference source to justify selecting fine sand from the aspect of the cost ([1]Facilitator). The students were prompted to relate spaces with water clarity ([2]Facilitator). She guided the students to see that each filtering material had its strengths and weaknesses by referring to the empirical evidence ([3]Facilitator and [4]Facilitator).

The facilitator managed to model how to justify the selection of filtering materials from different aspects: cost, water clarity and filtering time.

During the interview, the students agreed that modelling gave them a guideline for integrating knowledge. For instance, a student articulated that *"The facilitator explained the questions and prompts. Then, she gave examples like how we could compare the first and second filters. She showed us how to compare the filtering time between the two filters."*

4.1.5 Summarising

The facilitator asked the students to summarise the content of the whole class discussion to ensure that the students: (a) understood the objectives or process of the design task and; (b) grasped the main concepts underlying a design task. In the following scaffolding episode, just before the next exchange, the students had read the design problem and identified the design task. The facilitator asked a student, Betty, who looked confused, to summarise the discussion:

> [1]*Facilitator: Betty, can you summarise the design task? Or, in other words, what are you going to do in these four weeks?*
>
> [1]*Betty: We need to design a water filter.*
>
> [2]*Facilitator: Can you give more details, like how should it look like?*
>
> [2]*Betty: It should filter 500ml water fast, be cheap, attractive and produce clean water.*
>
> [3]*Facilitator: Good, Betty has mentioned four design criteria. Do you have anything to add?*
>
> [1]*Clara: We can only choose five materials to build a water filter.*
>
> [1]*Frank: We need to use knowledge from STEAM subjects to explain our plan.*
>
> [4]*Facilitator: Let me summarise what you all have said: In this design task, each group needs to design a water filter, which fulfils the five design criteria, using knowledge from the STEAM subjects.*

The facilitator attempted to make sure that Betty understood the design task ([1]Facilitator and [2]Facilitator). She also provided an opportunity for the other students, Clara and Frank, to add to Betty's explanation ([3]Facilitator). This strategy helped the facilitator and the students achieve a shared understanding of the design criteria and the learning objective.

During the interviews, the students agreed that summarising helped them focus on the design task. They explained: *"The facilitator restated the important details, like what we had to focus, at the end of the discussion."* and *"The facilitator repeated what we had to do so that we would not miss any important information."*

4.2 Linguistic Scaffolding

The facilitator focused on scaffolding the content knowledge and the accuracy of academic terms rather than the grammatical errors, syntax and sentence structures.

4.2.1 Defining Terms and Reformulating Responses Using Precise Academic Wordings

The students used scientific terms such as mass and weight as well as pores and space interchangeably. The facilitator defined some academic terms to help them differentiate the terms with similar meanings and clarify their misuse of terms. In the following scenario, Frank from Group F was explaining the reason for choosing fine sand to build the filter:

[1]Frank: One of the materials we chose to build our filter is fine sand. The pores between the fine sand are small.

[1]Facilitator: The term "pores" is not suitable. Pores are tiny holes on a surface, such as the sweat pores on our skin. Can you suggest a more appropriate term?

Frank used the term *"pores"* to describe the gaps between the fine sand, but this term is inappropriate ([1]Frank). The facilitator defined *"pores"* and prompted Frank to give a more suitable term to replace this term ([1]Facilitator). Following this scaffolding session, the facilitator reformulated Frank's utterance using appropriate wording. She said, *"The space between the fine sand is small",* which is more accurate. Space means the unoccupied area found in between objects. Pores can secrete some substances, but spaces cannot.

During the interviews, students expressed their views that this strategy was helpful. They said, *"I could understand the prompts better after the facilitator explained the terms...I learned the meaning of design criteria."* and *"The facilitator explained the meaning of terms. When we used a term wrongly, she pointed out our errors so that we could use the terms accurately."*

4.3 Metacognitive scaffolding

Metacognitive scaffolding was constantly provided to the students, especially during the evaluation stage, to help them reflect on their design solutions.

4.3.1 Thinking aloud

As the students practised thinking aloud, they internalised their thought. This strategy was frequently adopted to help the students become more self-aware of their learning. The example shown below took place when the students were reflecting on the strengths of their design solution. Gamir from Group G was reading aloud the question *"Which design criteria are fulfilled?".* It took him a while to make sense of this prompt, and he talked to his group member:

[1]Gamir: Is this question trying to check if our filter is good or bad?

[1]Galal: I think it is to check how many criteria our filter has met.

[2]Facilitator: Good. It is to see out of the five design criteria, which criteria have your filter met. For example, could you collect 150ml of water within 6 minutes?

[2]Gamir: Yes, we could...We only used 2 minutes 20 seconds.

[3]Facilitator: Okay...Which question haven't you understood yet?

[2]Galal: This one, "How can it fulfil the design criteria?"

The facilitator attempted to assess the students' understanding of the question ([1]Facilitator). Gamir had a vague understanding of this prompt as he merely knew that the students had to evaluate their designed artefact ([2]Gamir). Galal built on his team member's explanation, relating this question to the five design criteria ([1]Galal). The facilitator recognised Galal's ideas, stating and elaborating his statement to further clarify the question ([2]Facilitator). She also prompted them to self-evaluate their understanding of the prompts to help them aware of their knowledge gap ([3]Facilitator). As a result, Galal voiced out his confusion ([2]Galal).

4.4 Motivational Scaffolding

The facilitator motivated the students to keep their interest in the task and build their confidence in achieving the targeted learning goal.

4.4.1 Promoting Success Expectancy

The students' expectations for success were promoted by establishing their perceptions of belongingness, building their confidence, and praising them for their hard work. In the following example, Ilham from Group I was demotivated by the complex questions:

> [1]Ilham: Name the weaknesses of your water filter. Which criterion is not met? What is the evidence? (Reading out loud the questions). So many questions! We can't do it!
>
> [1]Facilitator: Do you have any problems?
>
> [2]Ilham: I cannot understand this question.

Ilham was overwhelmed by the complex questions and lost his interest in solving the question ([1]Ilham). The facilitator attempted to understand the challenges he faced ([1]Facilitator). She then explained that *"What you need to do is to compare your experimental outcomes with each criterion."* This helped the students identify two weaknesses of their water filter: unattractive and long filtering time. She praised the students for boosting their confidence, saying that *"Good job. You have identified two weaknesses from different aspects: attractiveness and filtering time. Be confident and voice out your ideas."*

4.5 Social Scaffolding

Social scaffolding, which included highlighting group rules, helped the students congregate fragmented ideas from different individuals into more comprehensive knowledge.

4.5.1 Highlighting Group Rules

Highlighting group rules to bootstrap positive collaborative learning helped the students develop scientific knowledge as a group. The facilitator explicitly described how she wanted the students to work together by saying, *"Each of you has designed an individual water filter. Each of you must take turn to share your individual design with your group members. Then, discuss among yourselves to design a group water filter."*

The facilitator created social spaces to optimise student interactions to negotiate with their group members before achieving consensus on their group design solution. She encouraged group interaction and tried to facilitate so that less vocal students could contribute their ideas. The facilitator noticed that Cantina, one of the members of Group C, had been very quiet. She was a passive participant who merely listened to her peers' arguments. The facilitator asked, *"Cantina, do you have a different way of thinking about how to design your water filter?"* Cantina explained her individual design idea in detail, an indication that she understood the design task. The facilitator highlighted the importance of collaboration, saying that *"All activities are group-based. So, each of you must contribute some ideas. Discuss among yourselves to come up with a new group design solution."* This strategy provided an opportunity for all group members to negotiate a shared meaning of the design solution.

4.6 Strategic Scaffolding

Strategic scaffolding was adopted to help the students design and then improve their solutions. In this study, strategic scaffolding was provided in the form of contrasting the students' design solutions and peer-reviewing.

4.6.1 Contrasting Cases

Contrasting cases helped the students notice (a) the dimensions of information that they might miss if only one single example were presented to them and (b) the general rules and significant design features which might affect the outcomes of their design solutions. An example of contrasting cases took place when the facilitator asked the Group E students to compare their designed artefact with Group F's. The facilitator asked, *"Can you state the similarities between the design from Group F and your group (Design E)?"*.

> [1]*Elagovan: Both groups used 2 cm cotton and arranged it on the top layer.*
>
> [1]*Eason: We all used cotton, coarse sand and fine sand.*
>
> [1]*Facilitator: How about the differences between the two designs?*
>
> [1]*Eiden: The filtering materials…Group F used 1cm of carbon, but our group (Group E) did not use carbon.*
>
> [2]*Elagovan: The arrangement of filtering materials…the position of coarse sand and fine sand is different…Our group arranged fine sand on top of coarse sand, but Group F arranged these materials in the opposite way.*

The facilitator prompted Group E to identify the similarities and differences between Design E and Design F ([2]Facilitator). The students named the similarities, such as the amount and types of filtering materials used ([1]Elagovan and [1]Eason). They also identified the differences in the types of filtering materials ([1]Eiden) and their arrangement ([2]Elagovan). Contrasting cases led the students to conclude that different factors, including the type, the arrangement, and the number of filtering materials, affect the design outcomes.

During the interviews, a few students explained that *"From the group presentations, I knew that there are many ways to design the water filter. Many factors affected the outcome of our designs such as the arrangement of the materials."* and *"When I listened to my friends' ideas, I compared my group design with theirs. I asked myself, 'How can their water filter produce such clear water? How can they filter the water so fast?'. It made me rethink my design so that I could improve my water filter."*

4.6.2 Peer reviewing

Each group was in charge of giving written feedback to one assigned group during the peer review session. The aims of the peer review session were two-fold: (a) to help the students reflect on their own designed artefacts while providing comments to their peers, and (b) to broaden the students' horizon of knowledge integration through critiquing their peers' designed artefacts. The facilitator distributed a peer review sheet to each student group, followed by demonstrating how to use this sheet during a whole-class discussion. A sample of the peer review sheet given by Group D to Group E is shown in Table 2.

Table 2. A Sample of Group D's Peer Review Sheet

The filtering time is 297 seconds, less than 600 seconds.
(1) The mass is high, 410g; (2) High cost, RM66.05; (3) The filtrate is still murky; (4) No arts element.
(1) Add decorative elements; (2) Reduce the cost by using less expensive materials or coloured stickers; (3) Reduce stone because it is heavy and has big spaces, so water might not be filtered well.

The evaluated group received their peers' comments, which helped them reflect on their design solutions from different aspects. For example, two students said that *"We could not see all bad*

things about our design. The comments from Group I gave us more ideas to improve our filter." and *"Peer review gave us more ideas to modify our water filter."*

4.7 A System of Facilitator's Scaffolding Strategies

This study found that the students' performance in knowledge integration was not the result of one particular scaffold but a combination of different strategies, which worked as a system to support student learning. In this vignette, the facilitator provided scaffolding to a group, Group G, which consisted of Gafar, Galal and Gamir, who were in the process of identifying the weaknesses of their water filter. The facilitator joined Group G when the students showed a lack of enthusiasm to complete the task. The small group scaffolding ensued:

> [1]*Facilitator: Are you facing any problems? (Motivational scaffolding: Showing concern)*
>
> [1]*Gafar: I have no idea how to answer this question.*
>
> [2]*Facilitator: Let's look at this question: What are the weaknesses of your filter? (Cognitive scaffolding: Focusing attention)*
>
> [3]*Facilitator: In other words, "what is not so good about your water filter". (Linguistic scaffolding: Paraphrasing)*
>
> [1]*Galal: I think our design has a long filtering time.*
>
> [4]*Facilitator: It is a good idea. (Motivational scaffolding: Positive feedback)*
>
> [5]*Facilitator: We have talked about the strengths and weaknesses of your water filter in the previous activities, right? What are the causes of the long filtering time? (Cognitive scaffolding: Linking to prior knowledge)*
>
> [2]*Galal: The cotton blocked the mouth of the bottle.*
>
> [1]*Gamir: I think it is due to the arrangement of the filtering materials.*
>
> [6]*Facilitator: Good try. I am glad that you still remember what we had discussed in the previous sessions. (Motivational scaffolding: Positive feedback)*
>
> [2]*Gamir: Our design is not attractive...*
>
> [7]*Facilitator: Why do you say so? (Cognitive scaffolding: Pushing for explanation)*
>
> [3]*Galal: I think there are two reasons. Its mass is high…and we didn't decorate the filter. We didn't have time that day.*
>
> [8]*Facilitator: See, each of you may have a different idea. Voice out your opinion. This can help you evaluate your filter from different aspects. (Social scaffolding: Promoting collaboration).*

In this vignette, the facilitator adopted different types of scaffoldings to help the students identify the weaknesses of their filter. Cognitive scaffolding such as pumping ([7]Facilitator) prompted the students to elaborate their explanations. The facilitator motivated the students by providing positive feedback such as *"it's a good idea"* ([4]Facilitator) and *"good try"* ([6]Facilitator). She paraphrased the *"weakness of the filter"* to *"what is not so good"* to help the students comprehend the question ([3]Facilitator). She promoted collaboration among the students to help them solve the task as a team ([8]Facilitator). Each strategy was calibrated based on the diagnosis of the students' responses to cater to their different learning needs.

5. DISCUSSION

Creating a strong connection between knowledge from different disciplines in the DBL context is a challenging process for students at any level. In this study, the facilitator flexibly adapted a variety of scaffolding: cognitive, linguistic, metacognitive, motivational, strategic, and social scaffolding to support student learning in this learning context. The facilitators continuously

diagnosed the progressive development of each student group to calibrate the type of scaffold, which could support the student learning. For example, cognitive scaffolding strategies such as questioning, pushing for an explanation and, linking to students' prior knowledge were used to remind the students of the relevant information and trigger their deeper thinking. Instructional strategies that utilise students' unique learning experiences can reduce their cognitive load by storing relevant information in their working memory (Kirschner et al., 2006). In addition, modelling set an example for imitation to help the students achieve the intended learning objective (Wood et al., 1976).

From the aspect of scaffolding students' language, the facilitator helped these students comprehend the question prompts by defining terms, paraphrasing sentences, and reformulating their discourses into more precise academic wordings (Smit & Eerde, 2013). Facilitators must help students articulate their ideas using scientific terminologies (Puente et al., 2013a). In terms of motivational scaffolding, conducting design activities with clearly defined goals, appropriate learning sources and, connections to students' interests can motivate them to integrate knowledge (Barron et al., 1998; Puente et al., 2013). Besides promoting students' expectancy for success, Belland et al. (2013) suggested that establishing task value, creating a sense of belonging and providing autonomy for students can enhance their motivation in learning. With high motivation, students will strive to achieve deep learning, such as solving a problem and utilising different approaches to gain knowledge (Belland et al., 2013).

Metacognitive scaffolding such as thinking aloud moved the students towards deeper thinking by saying out loud their understanding about the question prompts. This strategy created cognitive dissonance and pushed the students to reflect on the root problems of their design solutions (Reiser, 2004). From the aspect of social scaffolding, Hsi and Agogino (1995) advocated that small group discussions can help students make their mental models visible. Puente et al. (2013a) suggested facilitators provide feedback on teamwork as students need to collaborate with their peers throughout the DBL process. This study showed that creating social spaces for group interactions encouraged the students to merge the ideas of different individuals and collaboratively develop coherent, integrated knowledge. Kirschner, Sweller, Kirschner, and Zambrano (2018) explained that when a complex task with a large amount of highly interacted elements is distributed between multiple working mental models, cognitive load can be reduced if students know about working as a group.

This study indicated that multiple types of facilitator scaffolds, including cognitive, language, metacognitive, motivational, strategic and social scaffolding, worked as a system to facilitate student learning. This study concluded that student performance in learning is not a result of a single type of scaffold. Different types of scaffolding strategies work in concert to help students achieve a learning objective (McNeil, 2006; Tabak, 2004). Different scaffolding tools and agents can help students develop various knowledge and skills in a complex, open learning environment (Tabak, 2004). Thus, facilitators need to integrate different types of scaffolds seamlessly to support student learning in the DBL context.

6. CONCLUSION

The power of scaffolding lies in the interactions between different types of scaffolding strategies to complement the affordances and constraints of each other (Tabak, 2004). It is hard to differentiate the boundary of various types of scaffolding (e.g., cognitive, metacognitive, and strategic scaffolding) as they are intertwined to support a learning objective that a single scaffolding strategy cannot achieve (McNeill, 2006; Tabak, 2004). Thus, a system of facilitator scaffolds can be designed into the DBL environment to support student learning. It is necessary

to prepare teachers to scaffold student learning in the DBL context (Puente et al., 2013a). Researchers found that teachers play a limited role in facilitating student learning in the DBL context (Puente et al., 2013a). For instance, they rarely use the essential scaffolding strategies suggested by the past literature, such as providing feedback on work progress, triggering students to think of a problem from different perspectives and, encouraging students to explore alternative solutions (Puente et al., 2013a).

This study provides teachers, especially inexperienced pre-service teachers, with guidelines in shaping their new roles in scaffolding. Teachers need to have positive views on teacher scaffolds' legitimacy and crucial roles (Van de Pol, 2012). They need to provide adequate scaffolds to students while still recognising and promoting their active roles in learning, as the ultimate goal of scaffolding is to transfer the learning responsibility to students. Scaffolding may require entirely different orchestration of learning activity, classroom environment and teaching approaches (Talley, 2014). Teachers need to equip themselves with pedagogical and content knowledge and mental agility (Van de Pol, 2012) to gain expertise on scaffolding student learning. Careful planning of scaffolding strategies can help students move step-by-step along the iterative design stages towards a more in-depth understanding of knowledge.

Future studies can investigate the synergy between peer interaction and facilitator scaffolds to enhance students' knowledge integration. Collaborative learning reduces students' cognitive load as interacting elements are distributed between few students (Kirschner et al., 2018). Future research can also investigate collaborative cognitive load issues when students are scaffolded in groups with synergistic scaffolds. This can help teachers make informed decisions concerning the design of an effective collaborative learning environment for promoting knowledge integration. There are multiple zones of proximal development in a classroom (Smit & Eerde, 2013). Students may respond differently to the same type of scaffolding due to their different levels of understanding and their ability to interpret and use scaffoldings (Berland et al., 2014). It is often unclear how the facilitator's scaffolding strategies lead to students' progressive development in learning (Smit & Eerde, 2013). Thus, future studies can explore the impacts of using particular scaffolds such as cognitive scaffolds and social scaffolds on student learning in a DBL context.

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APPENDIX

Appendix 1: Interview Protocol

The researcher described the research, telling the interviewee about the (a) purpose of the interview, (b) the methods that would be taken to protect the confidentiality of the interviewees and data sources, (c) what would be done to the data sources, and (d) how long the interview would take.

1. What have you learnt from this design-based STEAM activity?

2. Did you face any challenges throughout your involvement in these activities? If yes, can you give examples of these challenges?

For the past three weeks, you had learned to link the knowledge or concepts from various STEAM subjects to design your water filter. We had also discussed that knowledge integration means linking different concepts from the STEAM subjects to solve a problem.

Scaffolding is the support provided by the facilitator to help you complete your tasks. In your case, scaffolding means "how the facilitator help you integrate knowledge to design and build your water filter". For example, the facilitator gave examples of how you could evaluate your water filter based on the experimental results.

2. Did you need facilitator's scaffold or support when you learned how to integrate knowledge throughout this design-based learning activity?

If the response is "yes",
(a) Why did you need the facilitator's scaffold?
(b) What types of scaffolds the facilitator provided to you?

If the response is "no",
(a) Why didn't you need the facilitator's scaffold?
(b) Did you receive support from other sources?

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Managing Emotions while Working from Home During COVID-19 Pandemic: Working Mothers with Young Children Perspective

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ABSTRACT

The struggle to balance work and family can be a major stressor for women with young children as it can negatively influence their emotional well-being. Studies have found that employed women experience greater difficulty than men in balancing between work and family as they have greater demands. Besides that, women tend to experience low psychological detachment from work while at home, and the emotions they experience at home have negative implications for their work engagement. This study aimed to investigate how working mothers with young children between 0 to 5 years old regulate their work-generated emotions while working from home during the coronavirus (COVID-19) pandemic. The pandemic forced workers to work from home to curb transmission of the virus. By utilizing the qualitative research method, this study gathered the perspectives of 20 Malaysian working mothers from various public and private organizations who were required to work from home due to the pandemic. They were chosen by using the purposive sampling method, and all transcribed interviews were coded thematically. Qualitative analyses revealed that working mothers often find it difficult to manage their emotions while attempting to balance childcare and work. Some discussed the possible problematic outcomes caused by working from homes, such as stress, anxiety, and social isolation. We conclude that working mothers struggle emotionally when working from home and the impact can vary depending on the age of their children and, their marital status. The study provides some initial evidence that the impact of work from home with young children on emotions is worthy of further investigation.

1. INTRODUCTION

Working from home is not a new phenomenon. Many studies in the early 2000s have attempted to understand the experiences and ways on how workers work from home as compared to working physically from the office (Anderson et al., 2015; Tietze, 2002; Tietze & Musson, 2010). However, the term *"work from home"* has become increasingly popular in various organizations across the world, especially in the recent years of the coronavirus pandemic. This pandemic forced many businesses to run remotely and transition their activities from home (Vyas & Butakhieo, 2020). The shift in the environment disrupted the global workforce at an unprecedented scale and speed. Hundreds and thousands of workers were laid off or put on unpaid forced to leave, while others were ordered to work from home to slow down the spread of the coronavirus (Arntz et al., 2020). The school closures forced many parents to work from home and, at the same time, care for their children (Bouziri et al., 2020).

Some studies revealed that employed women experience greater difficulty than men when it comes to working from home (Gálvez et al., 2018; Kinman, 2016). For instance, in a study conducted by Newcomb (2021), she found that female academics who also plays the role of parent experience tension due to the requirement of meeting the physical, temporal, and emotional needs of both students, colleagues, and their own children. This is because fathers often rely on their partners to be responsible for childcare tasks (Derndorfer et al., 2021). Many of these studies have been conducted in Western countries such as Australia (Newcomb, 2021; Powell & Craig, 2015) and United Kingdom (Van Der Lippe & Lippényi, 2018), whereas research on the patterns of women working from home in Asian regions remains scarce. Studies have suggested that Eastern culture imposes many family responsibilities on women (e.g., Khokhar, Nas & Zia-ur-Rehman, 2020). Furthermore, past studies on working from home in Asia have predominantly looked at the perceptions of men and women (e.g., Suarlan, 2017), yet women with young children's experiences and perceptions in the Asian context yet to receive much attention. Literature has consistently neglected the important aspect of work from home, which is the pressure of a woman who works remotely while trying to balance work and everyday life (Gálvez et al., 2018).

This study is set to find out how work-generated emotions are regulated while working from home during the coronavirus (COVID-19) pandemic. It draws upon findings of exploratory research with mothers of young children (0 to 5 years old) working in various organizations in the state of Selangor in Malaysia. The purpose of the present study was twofold: 1) To understand why working mothers with young children face difficulties managing their emotions, and 2) To discover how working mothers with young children manage their emotions when working from home.

2. LITERATURE REVIEW

2.1 Working from Home

Working from home or teleworking can be considered a double-edged sword (Farrell, 2017). There are many definitions of working from home, but studies broadly defined it as *"any paid work that is carried out primarily from home (at least 20 hours per week)"* (Crosbie & Moore, 2004, p. 224). It is argued that working from home enables workers to achieve work-life balance by making it easier for them to juggle work and home demands as there is no need to commute to work (Crosbie & Moore, 2004; Gálvez et al., 2018; Kossek & Thompson, 2016; Powell & Craig, 2015). Working from home may also increase work productivity (Bloom et al., 2015)

and enable workers to manage their spouse, children, older people, or disabled relatives (Crosbie & Moore, 2004).

In a study conducted by Anderson and Kaplan (2015), they found that working remotely can also reduce negative emotions such as stress and anxiety and increase positive emotions such as joy and happiness. One of the reasons for this is that workers could set up their own workspace at home in their own creative ways (Anderson & Kaplan, 2015). Moreover, working from home allows workers to reduce spending (Barrero, Bloom & Davis, 2020). Other than that, working from home is linked with high levels of autonomy and the reduction of work-family conflicts (Madsen, 2003).

2.2 Negative Impact of Working from Home

While many studies have pointed out the positive effects of working from home, other studies have also found that this is not always the case, as working from home can also have negative implications (e.g., Arntz et al., 2020). Transitioning from work to home is not straightforward as, at times, achieving a good work-life balance is not easy (Felstead & Henseke, 2017; Tietze & Musson, 2010). According to Clark (2000), organizations often expect workers to achieve a good work-life balance, and he defined this balance as *"satisfaction and good functioning of work and home, with a minimum of role conflict"* (p. 751). The lack of balance and stability between work and family can lead to stress (Dolcos & Daley, 2009). One of the major reasons some workers struggle to achieve this balance is because workers would often need to play multiple roles in their daily lives as an employee, spouse, and parent (van der Lippe & Lippényi, 2018; Vyas & Butakhieo, 2020). Workers need to 'learn' how to cope by being at *"home and at work"* (Tietze & Musson, 2010, p. 149). Working from home may interfere them from performing any of these responsibilities, which also may lead to work-family conflicts (Kossek & Thompson, 2016; Van Der Lippe & Lippényi, 2018; Voorpostel, 2014).

Other than that, studies found that many workers experience low psychological detachment from work while at home (Sonnentag et al., 2008; Voorpostel, 2014). This is also the case when it comes to detaching emotions that come from home while at work. According to Edwards and Rothbard (2000) and Greenhaus and Powell (2006), emotions experienced at home can have a negative impact on a person's work engagement. Often those working from home can experience social isolation, which leads them experiencing stress (Mann & Holdsworth, 2003). In a study conducted by Song and Gao (2019), they found that working from home may generate new sources of conflict and stress at home. Furthermore, various studies showed that workers find it difficult to set boundaries between work and family, thus leading to stress and tensions (Kossek & Thompson, 2016; Mann & Holdsworth, 2003; Van Der Lippe & Lippényi, 2018).

2.3 Employed Women and Working from Home

The inability to balance work and family life is one of the major factors that cause a negative impact on women's emotional well-being (Shepherd-Banigan, et al., 2016). This may be because household and work-related tasks are never-ending (Gurstein, 1991), and women spend more time dealing with chores than men (Manzo & Minello, 2020). According to Mann and Holdsworth (2003), women are often expected to combine other works when they work from home, such as daily domestic chores, compared to men. In a study conducted by Kinman (2016), she found that female academics have issues with achieving a good work-life balance. Female academics often find managing and completing the demands of work and home chores are challenging (Kinman, 2016). Besides that, a recent research conducted by Nash and

Churchill (2020) found that female academics faced the most challenges in terms of having to balance between academia and caring responsibilities during the coronavirus pandemic.

Many studies have pointed out that childcare responsibilities are not distributed equally between men and women despite both men and women being wage earners (e.g., Bianchi et al., 2012; Chesley & Flood, 2017). Working mothers are 28% more likely to experience burnout than fathers due to unequal demands at home (Leonhardt, 2020). According to a research conducted by Crosbie and Moore (2004), they found that women tend to get disturbed by their children while working from home. The disruption between work and family demands can lead to an increase in work-family conflicts (Mann & Holdsworth, 2003). Furthermore, work-family conflicts are a source of stress and are closely linked to negative experiences of emotional and physical ill-health (Mann & Holdsworth, 2003). These literatures suggest that women's role is more demanding than men and that women are pressured to conform to their gender roles.

In the case of the COVID-19 pandemic, many parents faced hardship due to the closure of schools and childcare centres (Arntz et al., 2020). They are required to do work and care for their children and focus on their homeschooling (Arntz et al., 2020; Derndorfer et al., 2021). In a recent study conducted by Derndorfer et al. (2021), it was found that the involvement of fathers in childcare during the pandemic increased only when their female partner was not able to work from home. A United-States Pew Research Centre survey conducted in October 2020 also found that working mothers struggled more than fathers when getting work done without interruptions (Igielnik, 2021; Murad, 2021). This is especially hard for mothers with children under 18 at home (Igielnik, 2021; Murad, 2021).

2.4 Challenges of Malaysian Working Mothers during the pandemic

In Malaysia, many published newspaper articles have highlighted the challenges of working mothers' experience during the pandemic, especially during the first phase of the Movement Control Order (MCO) announced by the Malaysian government (e.g., Mohd Said, 2020; Murad, 2021; Poo, 2021; Tang, 2020). The first MCO was in effect from 18 - 31 March 2020, and it had restricted citizens' movements and required more workers to work from home (Yusof, 2021). Furthermore, nurseries, government and private schools, public and private higher educations were also prohibited from opening (Restriction of Movement Order, 2020). A recent article published by The Malaysian Reserve indicated that mothers in Malaysia had expressed their *"grievances"* on social media due to the challenges working from home (Mohd Said, 2020).

Working from home can be physically and mentally taxing when women cannot manage their stress, which can lead to conflict with their husbands (Mohd Said, 2020). The article also indicated that failure to cope with responsibilities could cause stress which is unhealthy and harmful for their well-being (Mohd Said, 2020). According to the LinkedIn Opportunity Index 2021 survey, they found that 32% of working mothers in Malaysia expect organizations to provide flexibility in terms of work-from-home arrangements (32%) and offer the option for reduced schedules (30%) and part-time schedules (27%) so that they can balance their work and personal life (Ram, 2021).

Many studies have contributed to identifying the imbalance of work-life and the gender differences in childcare provision. This study anticipates finding evidence on how mothers with young children balance work and family during the pandemic. The use of open-ended responses and qualitative analysis, however, enabled us to explore further how they manage their emotions while balancing their lives. The research questions focused on the ways working

mothers with young children manage their emotions while working from home and how they balance work-life in general.

3. RESEARCH METHODOLOGY

3.1 Research Design

This research was conducted in the state of Selangor, Malaysia. This research employed a qualitative approach and was conducted from December 2020 to early February 2021. Data were collected through semi-structured, face-to-face online interviews with 20 working mothers who were forced to work from home by their employer at the time of the interview. The size selected was based on Creswell (2013), who indicated that the idle sample size should be between 5 to 25. This qualitative technique was preferred as it provides an opportunity to attain a greater level of depth and detail to reveal the participants' full range of perceptions and feelings regarding the subject matter (Cresswell, 2013). Participants were chosen by using the purposive sampling method. Purposive sampling enables an appropriate group, which is essential for the study, to be selected using a specific criterion (Tongco, 2007). To be eligible, participants were required to fulfil the following criteria: 1) female, 2) full-time paid employment, 3) a mother with young children, 4) working from home, and 5) working in public or private organizations in Selangor. All the interviews were conducted online using Google Meet, and the duration was between 45 and 90 minutes. University ethics approvals and informed consent from the participants were obtained prior to their participation in this study.

3.2 Interviews and Procedure

At the start of each interview, relevant information about the study, the procedure and the data usage were given to the participants who agreed to be interviewed and recorded. Data collection was made voluntary and via video call (i.e., Google Meet). Face-to-face interviews were not conducted due to the Malaysian government's social distancing measures to prevent coronavirus transmission at the time. Participants were asked open-ended questions about their experiences and managing their emotions with their small or young children while working from home.

The interview protocol started with a general question in order to get to know the participant. For instance, the interviewer asked questions such as *"Can you tell me a little bit about yourself?"*, *"What do you do for living?"* and *"How many children do you have?"* Questions were then funnelled towards asking more specific questions about the topic, such as *"What do you do to keep yourself feeling positive while working from home with small or young children?" "How do you manage your emotions?"* Probes were used to elicit further elaboration on the strategies that they have used to manage their emotions. The participants were also encouraged to provide examples and elaborate on the issues when the interview deviated from the original protocol. A pilot study to check the suitability of the questions was conducted with two female workers working in a private organization, and few changes were made to the questions. The interviews were conducted in English.

It was made clear to the participants that they had the right to withdraw from the study. To maintain the anonymity of the participants, pseudonyms were utilized throughout this article (e.g., Participant 1, Participant 2). The collected data were transcribed, and each participant was asked to review the content of their transcript for accuracy via email. This was followed by specific interview questions, and answers were matched and annotated to answer the research questions produced. The responses were analysed mostly based on each working mother's experience in dealing with their emotions when working from home with small or young

children and does not seek to compare the difference of response in terms of gender, age, and culture.

3.3 Data Analysis

Upon the completion of the data collection, the researchers analysed the transcripts thematically. The researchers first used an open coding process that focused on building larger themes and description emerged from the raw data. The stage of open coding was carried out using NVivo version 12 and through creating codes representing the participants' statements. The second stage involved axial coding, and the codes were linked to conceptual bins. This was followed by selective coding. The researchers integrated and refined the data in this stage. During data analysis, the transcripts were read and re-read for the researchers to familiarise themselves with the data set before they were divided into themes. Any overlapping and redundant codes were reduced. Data were then organized into three thematic blocks, which are *"working from home with small children"*, *"parenting process",* and *"managing felt emotions at home".* To reduce the risk of biased results and enhance the validity of the qualitative study, participants were asked to review meaningful quotes and interpretations by the researchers immediately after the sessions.

4. RESULTS

4.1 Working from Home with Small Children

Working from home is not a new phenomenon. However, it has been increasingly common since the COVID-19 pandemic that gravely wounded the world from the beginning of the year 2020. At the time of the interview, it had only been one year since the new coronavirus emerged. Those who were interviewed remained working remotely from home while others were able to return to work physically. At the beginning of the interview, participants were asked several questions on their experience working from home with small young children. Findings revealed that when working from home, mothers are expected to divide their time and energy for work, childcare, and household chores. Workers are expected to work as normal despite the dramatic change in the environment. The majority of the participants indicated that they had issues in separating responsibilities when working from home. For instance, Participant 1 believes that working from home has its pros and cons. She explained:

> *"The pro is that it can boost my productivity, and I could see some significant changes in the quality of my work due to the flexibility in time in completing my tasks; however, the cons is that I feel that communication with my team members can be tricky and that of course, I need to manage my time well between work and family."*

Participant 1 also expressed that sometimes she does feel less motivated to do work due to the absence of physical separation between work and leisure time. In her own words, *"I feel it's difficult to set my mind to work mode when at home."* Participant 3 also felt the same and indicated that *"As a working parent and the need to work from home, I do struggle to separate responsibilities."* Participant 6, on the other hand, explained in length:

> *"I need to cater to my children's needs, and I am also bound to commitment with house chores concurrently with work submission. Hence, I have to wake up early in the morning and settle the kids before 9 am on the working day. It can be exhausting."*

Participant 6 added that working from home with small young children requires one to be *"strong and resilient."* Apart from that, Participant 7 claimed that working from home is not

easy as it requires mothers to entertain their children first before they are able to concentrate on their work without any distractions. Participant 15, on the other hand, warned that those who have never experienced working from home and are required to do so for the first time might encounter difficulties with switching roles at home. She said:

> "To some working mothers who are working from home for the first time, everything might be a little hectic to really focus on work. Cause you have to play your role not only as a worker but also as parent, sibling, child, and spouse."

Like the other participants, Participant 9 also expressed her struggles of working from home with small children. She revealed:

> "I live with my husband and three children. The youngest is five. I think I cannot concentrate much if I'm working from home because I need to cater to the needs of my children as well. When at the office, I could concentrate fully on my work. But when working from home, of course as a mother and wife, I also need to prepare for my children's needs."

In addition, Participant 9 finds parenting difficult since she is unable to send her children to school due to the COVID-19 active cases. One of the participants (Participant 10) who need to work while caring for her five children said that she enjoys working from home but, at the same time, admits that it can be tough. Working from home with small children requires her to balance her responsibilities and attention between work and family. She claims that small children often demand more attention than older children and that they are *'clingy'*. She also said:

> "Every time I open up the laptop to start my work, my kids will also start to be clingier with me, and this makes me become distracted and unable to focus on my work. I try to spend half of my day to complete my work, and the other half, I spend with my family."

When asked whether the participants had difficulties in communicating with their colleagues while at home, some of the participants admitted that they found it difficult to communicate with both of their colleagues and clients when they were not in the office, for instance, Participant 1 expressed:

> "I find it quite difficult in terms of communication with my colleagues and clients. It's hard to see teammates in chat or a weekly video call. I had to cancel my meeting with potential clients. Even though we regularly contact through emails and WhatsApp, but still, I'm not really satisfied with that."

4.2 Parenting Process

Although there were no questions that directly asked about the role of their spouses when it comes to childcare during the pandemic, some participants mentioned their spouse playing a minimal role. Some were, however, fortunate enough to have a hands-on spouse. For instance, Participant 4 said:

> "My husband is around as he works from home, and he does help a bit when I need to attend online meetings but other than that, I normally handle the children."

Another (Participant 8) admitted:

> "My husband holds a top position at his company, and he has meetings almost every day, so sometimes I find it tough to have to focus on my job and at the same time take care of my kids. I try

to make sure my kids are OK, and at the same time, I am often busy on my phone typing away messages or sending emails, and people will think that I'm ignore my children, but in reality, I'm actually doing work. When my kids are asleep, I continue doing work".

Despite working from home has its benefits, such as being able to spend more time with family and reducing the hours spent commuting to work, the participants did feel that at times, working from home can reduce their work performance. For instance, Participant 13 explained that working from home can be fun at times as she gets to spend more time with her family, but it prevents her from performing productively. Participant 17 also mentioned the same and indicated that it was due to the lack of set-up at home. She said:

"I think most of us find it is just natural to work in the office as it is more comfortable with a proper office setup, working colleagues, proper working period. The conducive environment not only can keep me motivated but my colleagues as well compared to working from home where occasionally you'll be in a meeting, and your child will be calling out your name for help."

While most of the working mothers indicated that managing time between work and family is the key for working from home, two participants admitted that they were not able to do so. Both divorcees provided the same reason due to their status. They claimed that being a single mother requires them to take care of their children and complete their work simultaneously. One of them (Participant 12) expressed sadly:

"I have to take care of my children and, at the same time, do work stuff. I just can't do two things at the same time. It gets even tough when my boss and colleagues are not understanding. They are lucky that they have their spouse or even helper to help them around. People like me have a hard time working from home due to additional responsibilities. Having kids at home is tough as kids really need extra attention, and I just can't give that to them."

The other (Participant 14) exclaimed:

"I just can't work from home with my child around. There is no way you can divide time. Sometimes I need to attend an online meeting, but at the same time, your child is sleepy or hungry. What do you do when this happens? Trust me, there are many times that I want to quit so that I could prioritize my child. But if I quit, how do I earn money? I'm divorced, and I don't have anyone else to help take care of my child, unlike other working mothers."

4.3 Managing Felt Emotions at Home

Since the COVID-19 pandemic emerged, the dual demands of work and childcare started to take a toll on working mothers' emotional well-being. Working mothers are expected to find ways to manage their own emotions in order to keep themselves feeling positive and prevent them from feeling burnout and stress at home. The majority of the participants indicated that their daily routine also involves keeping their family's emotions positive. Participant 1, for instance, indicated that the lockdown period in Malaysia due to the coronavirus took a toll on her mental health. She had to quickly find ways to manage her emotions and ensure that she remained positive. According to Participant 1, one of the ways that helped her manage her own emotions was by staying connected with her friends and family. She advised, *"Well, too much time spent in isolation can lead to loneliness and depression, so reach out to others as often as possible."* Participant 1 also explained in length:

"I try to keep positive by playing family games and trying new recipes. My three-year-old daughter insists on helping me, but of course, she ends up making a mess. Although it can be stressful working from home, but I believe it somehow has strengthened my family bond as I could do things that I've

missed out over the years. I do feel contented as I am able to be there for my family, especially my daughter, who is growing up pretty fast."

Participant 8, who also responded similarly, indicated that she manages her emotions while working from home by chatting with her family and spending more time with them together. She added:

"I watch Netflix and play video games with my children during my free time. Working from home with children does take a lot of effort. I need to double my effort. Not only do I need to settle my work according to the 'Turn Around Time' but also sort out my family. But I think in a way, working from home does allow me to be closer to God, and it has made me become more disciplined and cautious about self-cleanliness."

Participant 5, on the other hand, believes that creating a calm and relaxing environment at home can induce positive emotions within her family members. In her own words:

"It is important to make sure that your house is peaceful, calm, and relaxing. That way, not only you, but your family will feel positive too. I'm often busy with work, and with small kids, they can be sensitive. They know when you're neglecting them, and they can act up. To avoid this from happening, I do work quickly and spend time with them through activities like cooking together with them and watching tv or reading a book."

Participant 5 added that she believes that her family will also *"be happy" when her house is in order.* According to Participant 9, one of the ways that could help her avoid negative emotions is by doing activities that can make her family feel healthier. She explained, *"We try to exercise at home whenever we can or sometimes, we teach our kids some fine or gross motor skills like playdoh, make an origami and so on."*

The findings of this study also showed that the majority of the participants who are of Islamic faith indicated that one of the ways they elicit positive emotions is by practising their faith. They believe that praying can help deal with stress and anxiety at home that are mainly the result of having to find ways in balancing work and childcare. For instance, Participant 4 said:

"As a Muslim, I pray, meditate, and recite the Qur'an as well as do light exercises at home. Those are some of the ways on how I keep my emotions positive. I'm sure you know that taking care of small and active children is never easy, so praying is one way that helps me calm my nerves and anxiety."

Participant 6 claims that one of the ways she replenishes her emotional energy is by praying. She said:

"Working at home with my children, it's not easy to create a positive environment. I have kids to nurture and work to commit, and I cannot be emotional and upset. Sometimes I do feel like lashing out on my children, but I stop myself from doing so. So, what I do is I have to keep refilling my emotional tank with prayers and reading. I must prepare and practice good mental health."

More than half of the participants highlighted that having an understanding of colleagues and superiors, as well as a good relationship with them, can help reduce the negative aspects of the participants' emotions. Participant 15 was very clear: *"Seeking support from my colleagues".*

Participant 16 also replied:

"My colleagues and boss are very understanding, and they try to help whatever they can whenever I have to handle my kids."

For others, like Participant 18, it was their spouse support. Participant 18 explained:

> *"It's not easy to deal with small children at home. Sometimes your boss doesn't understand that you have needy children. I may not have any issues if they were older. But we're talking about children below five. They constantly need your attention. My husband's job requires him to be at his workplace every day. He does help me with the kids before he leaves for work in the morning. What I normally do is I get support from talking to my husband during the day. He's always giving me comforting words, so I feel less stressful. On the weekends, he takes over childcare to let me rest."*

5. DISCUSSION

In this study, we examined how working mothers with small young children's respond in managing emotions while working from home during the pandemic. We aimed at providing qualitative evidence into the ways working mothers cope with working from home, and discussion about this topic is an important yet under-researched topic.

5.1 Working from Home during the COVID-19 pandemic

Our findings revealed that working from home during the COVID-19 pandemic can affect workers both positively and negatively. One of the positive aspects of working from home is that working mothers can spend more time with their families. Many had mentioned that they also play games, watch TV, and read books with their children. For instance, Participants 1 and 8 indicated that whenever they can, they will play games with their children. Similarly, Crosbie and Moore (2004) noted that working from home enables workers to achieve a work-life balance. Moreover, working from home means that they could reduce the time they commute to and from work. Findings revealed that it is due to the demands of work, lack of social interactions, and the fact that their spouses play a minimal role when it comes to helping in taking care of their children. The findings are similar to past research, which highlights the struggle of women juggling work and taking care of their children (e.g., Bianchi et al., 2012; Chesley & Flood, 2017). These research, however, were mostly conducted before the pandemic.

Although this study did not seek to compare the difference of response in terms of gender, age, and culture, findings showed that women felt that they experienced more pressure during the pandemic than men. Thus, those with young children struggled to balance work and childcare at the same time. Not all participants involved in this research are married. The findings revealed that working mothers of different marital statuses (married versus divorced) felt more pressure dealing with the emotional demands of their profession and motherhood. Several single mothers' participants expressed their struggles and felt that they could not manage their emotions well compared to those with a partner. For instance, Participants 12 and 14 felt that they could not distribute the heavy load of childcare to others, unlike those with a spouse who can delegate childcare responsibilities.

5.2 Coping with Competing Demands

This study suggests that the competing demands of work and motherhood can take a toll on the working mothers' emotional well-being and affect their work performance. Working mothers experience pressure having to juggle work and childcare while working from home. They find it hard to focus on two tasks at the same time. With small young children who often demand attention, it is rarely possible to focus on their work. This is similar to what Van der Lippe and Lippényi (2018) pointed out that one of the major reasons workers struggle to achieve good

work and life balance is the multiple roles that they need to perform, such as an employee, spouse, and parent.

As presented, working from home can induce negative emotions due to the inability of juggling between work and life demands. Therefore, working mothers manage their emotions in various ways to improve their emotions. The findings suggested that praying can be helpful to make them feel at ease. Having a good support system, whether from their spouse, family, and even colleagues, help them remain positive. A few participants also highlighted that not supportive colleagues could create a negative experience when working from home. The participants believed that with immense support, it could help them cope better, especially when working from home with young children. Other ways that helped the participants reduce social isolation and improve their emotions include cooking and interacting with friends and family. Due to the pandemic, movement was restricted, thus preventing the participants from travelling and meeting their friends and family.

6. CONCLUSION

Before we address the limitations and future directions of this research, the strengths of the present study must be presented. This research offers three main contributions to research concerning emotion management. First, this research provides insight into the differences between the management of emotions that originated from work and inside the worker's home during the pandemic. Previous research tends to focus on emotions managed in the workplace pre-pandemic (e.g., Ashkanasy et al., 2016; Morris & Feldman, 1997; Rehman et al., 2021). By exploring the emotions managed from work and home, the current research furthers the understanding of how workers, in this case, working mothers, improve their own emotions. Second, this research contributes to understanding why working from home can induce positive and negative emotions towards working mothers, especially those with young children. Finally, our research makes a third theoretical contribution by offering insights into the importance of external support such as family, friends, and colleagues while working from home.

Several limitations are evident in this research. First, as a study involving samples in a particular state and country – the findings are specific to this location. It is important to note that the findings may differ in other countries and cultures. Furthermore, the support system may also be different. Second, as with a lot of qualitative research due to the small sample size, this study cannot be generalized to a wider population. To further extend this study, the researchers hope to interview more participants from various organizations and countries in the next study. Third, the findings were derived during a time when movements were restricted due to the pandemic and schools, and childcare centres had to close. Therefore, findings may differ in other contexts and circumstances. Furthermore, more studies are also needed to explore the role of fathers in supporting their spouses while working from home.

In conclusion, the findings presented here explored how working mothers with young children manage their emotions surfaced several further questions. What are the roles of working fathers in childcare during the pandemic? How can organizations help support and reduce the pandemic impact on their employees working from home with children? These questions warrant further attention for both in terms of research and reflective practices.

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APPENDIX

Appendix 1: Interview Questions

1. Before we begin, can you please tell me a little bit about yourself?
2. What do you do for a living?
   a. Is there such thing as a typical day or week and what does it look like?
   b. What do you like most about your job? And what do you least like?
3. How many children do you have?
4. How old are your children?
5. How long have you been working from home?
   a. Was the transition from office to home easy?
6. What was your work routine like before the pandemic?
7. Do you prefer working from home or your office? Why?
8. How has it been working from home especially with young/small children?
9. Do you think working from home with young/small children difficult?
   a. What about older children?
10. What is your schedule like when it comes to managing your work and children?
11. What is your support system like currently?

12. What do you do to keep yourself feeling positive while working from home with small or young children?
13. How do you normally manage your emotions?
    a. How do you keep your children feeling positive?
14. Was there a time when you felt like you could not control your emotions while working from home? If yes, what was the main reason?
15. Are your colleagues understanding with your current situation?
16. Have you ever encountered any difficulties in communicating with your colleagues while working from home?
17. Before we end, have you got anything to add that we haven't discussed that you might think be relevant?

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Psychosocial and Physical Stressors among Healthcare Providers in Intensive Care Unit and Emergency and Trauma Department

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ABSTRACT

Healthcare providers often reported having physical and mental stress. It may be due to stress-related health problems that contribute to a severe public health issue. This study aims to determine the psychosocial and physical stressors among healthcare providers in the Intensive Care Unit and the Emergency and Trauma Department of Hospital Sultanah Bahiyah, Alor Setar, Kedah. A descriptive cross-sectional study with a purposive sampling technique was conducted between July and August 2020. The Job Content Questionnaire was used as the measurement tool, and the data were analysed with descriptive and inferential statistics. A total of 140 nurses and medical assistants participated in the study. The findings show that although the respondents have good working condition, they experienced high physical stressors. The results indicated that the job control differed statistically and significantly for gender, job category, working area and working hours. It also revealed a significant difference between psychological job demand and working hours. Physical demand is associated with gender, marital status, job category, age and working hours. Lastly, the results indicated a statistically significant association between social support with gender and working area. It can be concluded that the male gender, specifically those working in ETD, have better working conditions. However, most of them, especially the younger medical assistants, male and single ones, reported experiencing physical demand. Healthcare providers who have long working hours (per week) also have high physical and psychological job demands. Therefore, special attention should be given to this group of healthcare providers to prevent them from suffering any physical and psychological harm and injury.

1. INTRODUCTION

Job stress is defined as a harmful physical and emotional response when job requirements do not match the workers' capabilities, resources, or needs (Lua & Imilia, 2015). Job stress is a negative emotional and physical response that may arise when employees' skills, capabilities, or needs do not meet the job requirements. In other words, it is an interaction between the work environment and the employee's characteristics and additional job requirements and pressures that renders the individual incapable of performing their tasks (Najimi, Goudarzi, & Sharifirad, 2012). It can also lead to burnout, mental exhaustion and has adverse effects on one's health. High job demands, discrimination, bullying, and perceived job insecurity are a few of the stressors identified at the workplace (Milner et al., 2018). Elements of work organisation and culture include attitude, values, and practices, affect employees' mental and physical health. This will impact the quality of care, client satisfaction, and healthcare providers' safety and patients (Burgess et al., 2010).

Job stress is harmful to healthcare providers. They may develop tiredness, harsh behaviour, anxiety, increased blood pressure, lack of self-confidence, lack of job satisfaction, and decreased work efficiency. It can cause depression, isolation from patients, absence, and a decrease in their performance. Work-related fatigue is one of the most common phenomena experienced by shift workers, especially among healthcare providers. According to a study, 91.9% of nurses complained of work fatigue (Ismail et al., 2019). Symptoms related to musculoskeletal disease, sleep disorder and mental health disorder come from psychosocial hazards, and it has been related to physical workload and psychosocial stress (Oakman et al., 2018; De Cieri et al., 2019). Psychosocial risk and burnout are also positively associated with quality of life and physical and psychosocial health (Asante et al., 2019). Arguably, healthcare providers working in a critical care setting, such as in the Emergency and Trauma Department (ETD) and Intensive Care Unit (ICU), are at greater risk of being affected by psychosocial work stressors. This is because work conditions are often hectic and unpredictable, with broad variations and constantly changing pathology received each day (Abdul Rahman, Abdul-Mumin, & Naing, 2017a). Psychosocial hazards have the potential to cause harm to an individual's health and safety, as well as other adverse organisational outcomes. If one were to look at the types of employers` issues regarding psychosocial risks, they would find references to workload, communication, and relationships at the workplace (Leka et al., 2015).

A study in the United States reported that nurses often do physically demanding jobs involving long working hours, contributing to a low level of leisure-time physical activity. They are also reported to have a high prevalence of musculoskeletal injuries (Nam et al., 2018). Next, a previous survey conducted in Ireland found that older nurses relatively have higher perceived stress from the physical workload and job strain (Mc Carthy et al., 2018). However, the study's sample was collected from teaching hospitals in Western countries, limiting the generalisation of the findings to eastern setting. Different form the previous studies, this study proposes psychosocial work environment factors as the most crucial component to consider when determining the workplace's health and safety. In Brunei, a study found an association between psychosocial, musculoskeletal disorders and fatigue due to excessive work among the healthcare provider (Abdul Rahman et al., 2017b), while a study conducted in Kuala Lumpur showed that almost 25% of nurses who participated in the study perceived occupational stress and nurses working in the medical department have higher stress than those who worked in other units (Sharifah Zainiyah et al., 2015). Nevertheless, the study was not conducted among healthcare providers in critical care units such as ICU and ETD. ICU and ETD are critical areas,

and these departments mainly provide care for life-threatening patients with severe conditions that need continuous and close monitoring.

Although literature on psychosocial and physical stressors among healthcare providers is abundant, limited study has focused on Malaysian northern region. Hence, the findings of this study will contribute new knowledge on psychological, social, and physical stress among healthcare providers especially in the northern part of Malaysia. A good understanding of the problem would enable proper intervention of existing practices and policies, specifically in a health-related area. This study aims to determine the psychosocial and physical stressors among healthcare providers in the ICU and the ETD of Hospital Sultanah Bahiyah, Alor Setar, Kedah. The research questions of the study were:

1. What is the score level of psychosocial and physical stressors of the healthcare providers?

2. Is there any significant association between psychosocial and physical stressors with the healthcare providers' characteristics?

2. METHOD

2.1 Design, Ethical Approval, and Sample

The design of this study is a descriptive cross-sectional survey. The study was conducted in the Intensive Care Unit (ICU) and the Emergency and Trauma Department (ETD) of Hospital Sultanah Bahiyah (HSB), Alor Setar, Kedah, from 1 July to 31 August 2020. Ethical approval was obtained from the UiTM Research Ethics Committee (600-TNCPI (5/1/6) and the Medical Research and Ethics Committee, Ministry of Health Malaysia (KKM/NIHSEC/P20-528(5). Respondents in this study participated voluntarily, and respondents who decided to participate were asked to sign the consent form before their involvement. Respondents were informed about the study matter, and their confidentiality was maintained.

Purposive sampling was employed, and the sample size calculation was determined by Raosoft Software (2004). The total count of this population is approximately 185 healthcare providers. With a margin of error of 5% and a confidence level of 95%, a total of 126 respondents is considered adequate. However, 10% of respondents were added (adjusted for the non-response rate) from the actual sample size to a final sample size of 140.

The inclusion criteria of this study were registered nurses and medical assistants who engaged in clinical duty that included face-to-face contact with patients to give treatment and care. The exclusion criteria were medical officers who did not have direct clinical contacts with patient care, such as nurse managers, medical assistant supervisors and administrative staff. During the data collection period, nurses and medical assistants on maternity leave, sick leave or annual leave were also excluded from participating in this study.

2.2 Survey Instrument and Statistical Analysis

Data were collected using a set of questionnaires which were divided into two parts. Part A was to collect data on respondent's characteristics. It consists of seven items: age, gender, marital status, job category, working area, years of working experience and working hours per week. For Part B, this study adopted the Malay version of the Job Content Questionnaire from the

work of Amin et al. (2015) to measure the respondents' psychosocial and physical stressors. The scale comprises 33 items and is divided into four constructs: job control/ decision latitude (8 items), social support (8 items), psychosocial job demand (5 items) and physical demand (12 items). All these items were measured using a 4-point Likert scale, ranging from *"strongly disagree", "disagree", "agree"*, and *"strongly agree"*. Higher scores indicate better working conditions for the job control and social support domains. However, higher scores in the other two parts (psychosocial job demand and physical demand) indicate higher physical and psychosocial stressors (Amin et al., 2015).

A pilot study was done before conducting the actual study. The results revealed that the Cronbach Alpha for the instruments were acceptable for PPS (α=0.796). For each sub-scale, the alpha value showed: job control was 0.761, psychosocial job demand was 0.854, physical demand was 0.970, and social support was 0.957. The data collected were analysed with IBM SPSS Statistics version 23. The descriptive and inferential statistics (i.e., Mann- Whitney test and Spearman Correlation Coefficient) were used for the analysis. A p-value of less than 0.05 was considered significant to reject the null hypothesis.

3. DATA ANALYSIS AND RESULT

3.1 Characteristics of the Respondents

A total of 140 healthcare providers participated in the study. On average, the mean age for the healthcare providers is 34.14 years (SD=6.12), the mean for years of working experience is 10.18 years (SD=5.48), while the average working duration per week is 44.91 hours (SD=4.73). Most of the respondents are female (n=115, 82.1%), married (n=107, 76.4%), registered nurses (n=111, 79.3%) and working in ICU (n=80, 57.1%). Table 1 shows the characteristics of the respondents.

Table 1. Characteristics of Respondents (*N*=140)

Variables		*Frequency (n)*	*Percentage (%)*
Age	Mean ± SD	34.14 ± 6.12	
Working Experience	Mean ± SD	10.18 ± 5.48	
Working duration/week (hours)	Mean ± SD	44.91 ± 4.73	
Gender	Male	25	17.9
	Female	115	82.1
Marital Status	Single	33	23.6
	Married	107	76.4
Working Area	ETD	60	42.9
	ICU	80	57.1
Healthcare Profession	Nurses	111	79.3
	Medical Assistant	29	20.7

3.2 Psychosocial and Physical Stressors of the Respondents

Table 2 shows the mean and standard deviation of four different categories of job content scale.

Table 2. Mean and Standard Deviation of Job Content Scale (*N*=140)

Item	Job Content Scale	Mean	SD	Median	Interquartile range (IQR)
	Job control (min=18.00; max=32.00)	23.84	2.82	23.00	3.00
Q1	Learn new things	3.29	0.457	3.00	1.00
Q2	Repetitive job	3.18	0.498	3.00	0.00
Q3	Requires creativity	3.14	0.442	3.00	0.00
Q4	Allows own decision	2.58	0.700	3.00	1.00
Q5	High skill level	3.28	0.510	3.00	1.00
Q6	Various work	2.79	0.556	3.00	1.00
Q7	Lots of say	2.51	0.673	2.00	1.00
Q8	Develop own abilities	3.06	0.637	3.00	0.00
	Psychological Job demand (min=10.00; max=19.00)	13.49	1.744	13.00	2.00
Q9	Work fast	3.24	0.493	3.00	1.00
Q10	Work hard	3.34	0.476	3.00	1.00
Q12	Conflicting demand	2.20	0.590	2.00	0.00
Q13	Hectic work	2.10	0.527	2.00	0.00
Q16	Free from pressure made by another	2.62	0.643	3.00	1.00
	Social Support (min=15.00; max 32.00)	24.99	3.090	24.00	3.00
Q19	Supervisor is a good organiser	3.03	0.611	3.00	4.00
Q20	Supervisor pays attention	2.97	0.562	3.00	0.00
Q21	Helpful supervisor	3.03	0.562	3.00	0.00
Q22	Supervisor is a good organiser	3.04	0.574	3.00	0.00
Q23	Co-workers competent	3.25	0.482	3.00	1.00
Q24	Co-workers interest in me	3.16	0.499	3.00	0.00
Q25	Friendly co-workers	3.26	0.517	3.00	1.00
Q26	Co-workers helpful	3.25	0.467	3.00	1.00
	Physical Demand (min=27.00; max 48.00)	35.32	4.304	34.00	6.00
Q11	Lots of physical effort	3.38	0.556	3.00	1.00
Q14	Moving/lifting heavy loads	3.24	0.622	3.00	1.00
Q15	Rapid physical activity	3.25	0.511	3.00	1.00
Q17	Awkward body posture	2.55	0.823	2.00	1.00
Q18	Awkward arms positions	2.32	0.671	2.00	1.00
Q27	Lifting and lowering to or from the floor	3.14	0.419	3.00	0.00
Q28	Lifting and lowering objects with shoulders	3.04	0.535	3.00	0.00
Q29	Bending or twisting waist while working	2.67	0.673	3.00	1.00
Q30	Pushing or pulling patients or objects	3.09	0.556	3.00	0.00
Q31	Standing in the same position	2.69	0.722	3.00	1.00
Q32	Repetitive movements with hands/wrists	2.87	0.644	3.00	1.00
Q33	Applying pressure with hands/fingers	3.09	0.617	3.00	0.00

The total mean for job control (mean=23.84, SD=2.82) and social support (mean=24.99, SD= 3.09) are moderately high. These imply that most of the healthcare providers in this study have better working conditions. The psychological job demand (mean=13.49, SD= 1.74) has the lowest mean value, while the response to physical demand (mean=35.32, SD=4.30) has the highest mean score. It implies that most healthcare providers in this study consider themselves to have low psychosocial stressors but high physical stressors. It is reflected in Table 2 that the highest score in the physical demand domain is "Lots of physical effort" (mean=3.38, SD=0.56), followed by "Moving or lifting heavy loads" (mean=3.24, SD=0.62) and "Rapid physical activity" (mean=3.25, SD 0.51).

3.3 The Association between Psychosocial and Physical Stressors with the Respondents' Characteristics

The Mann-Whitney test was used to determine the association between job content and gender, education level, marital status, job category and working area (Table 3). The results indicated that the job content in the male group is statistically significant. In contrast, the opposite is found in the female group for job control, physical demand and social support ($p<0.05$). As for the association between job content and marital status, the finding reveals a significant difference in physical demand ($p<0.05$). Table 3 also shows a statistically significant difference for job category with job control and physical demand ($p<0.05$). Lastly, the results indicated a significant difference between a working area with job control and social support ($p<0.05$).

Table 3. The Differences Between Job Content Scale with Gender, Marital Status, Job Category and Working Area (N=140)

Group	Scale		Job Control		Psychological Job Demand		Physical Demand		Social Support	
		n	Mean Rank	Z	Mean Rank	Z	Mean Rank	Z	Mean Rank	Z
Gender	Male	25	92.28	-2.994*	57.06	-1.869	92.96	-3.070*	85.28	-2.106*
	Female	115	65.77		73.42		65.62		67.29	
Marital Status	Single	33	77.85	-1.203	78.27	-1.288	85.38	-2.423*	75.47	-0.843
	Married	107	68.23		68.10		65.91		68.97	
Job Cat.	Nurses	111	65.95	-2.621*	73.82	-1.935	63.36	-4.098*	68.01	-1.489
	MA	29	87.90		57.81		97.84		80.03	
Working Area	ICU	80	60.24	-3.491*	72.10	-0.551	70.58	-0.025	60.61	-3.488*
	ETD	60	84.18		68.37		70.40		83.68	

*$p<0.05$ statistically significant

The Spearman's rank-order correlation was used to determine the association between job content scale with age, working experience and working hours. Table 4 shows a weak negative correlation between age and physical demand group (r_s=-0.246, p=0.003). Meanwhile, the study shows a weak positive correlation between working hours with job control (r_s=2.22, p=0.008), psychological job demand (r_s=0.285, p=0.001) and physical demand (r_s=0.200, p=0.018).

Table 4. The Association between Job Content with Age, Working Experience and Working hours (*N*=140)

Variable	Job Control		Psychological Job Demand		Physical Demand		Social Support	
	r_s	*p-value*	r_s	*p-value*	r_s	*p-value*	r_s	*p-value*
Age	-0.091	0.282	-0.151	0.075	-0.246	0.003*	0.044	0.607
Working Experience	-0.061	0.477	-1.134	0.114	-0.123	0.149	0.014	0.874
Working Hours	0.222	0.008*	0.285	0.001*	0.200	0.018*	0.101	0.236

*p<0.05 statistically significant

4. DISCUSSION

4.1 Characteristics of the Respondents

The results showed that a majority of the healthcare providers were female, nurses, married and working in ICU. The average age of the healthcare provider is 34 years, while the average number of years working is 10 years. The average duration of working hours per week in this study comes to about 45 hours, which is high in comparison to other settings. For example, in other countries like Australia and many other organisations, the average working hours are between 35 and 40 hours per week. The interchange between working time and commuting versus other aspects of human life might have caused stress to the employees (Milner et al., 2017).

4.2 Psychosocial and Physical Stressors of the Respondents

The study's primary objective was to determine the psychosocial and physical stressors among the healthcare providers. The findings showed that healthcare providers reported to have better working conditions and have low psychosocial stressors. As reported in the results, the healthcare providers claimed that working in this area enabled them to learn new things, requiring a high level of skills. Besides, they received good social support and were considered to have competent, friendly and helpful co-workers. Another factor contributing to this is that most of the respondents are married, whereby previous research had shown that married people have stronger mentalities (Bulloch et al., 2017).

However, the results showed that the healthcare providers have high physical stressors. Most of them reported that their job required a lot of physical effort, moving and lifting heavy loads, and performing rapid physical activity. Physical demand needs healthcare providers to use their physical effort to do the task that has been assigned to them. As a result of the various regulations, there are more time limits, physical demands and decision-making difficulties (Steege et al., 2015).

4.3 The Association between Psychosocial and Physical Stressors with the Respondents' Characteristics

This study showed an association between job control with gender, job category, working area, and working hours. The results indicated that males working as medical assistants in ETD, and staff with high working hours, reported better working conditions. Moreover, for the social

support subscale, it was found to have similar results. Male staff and those who worked in ETD reported having better working conditions. Thus, it can be concluded that those who work in the emergency unit have good working conditions.

Results also showed that there is a relationship between psychological job demand and working hours. Healthcare providers who have long working hours were reported to have high psychological job demands. Their superiors expect them to have skills in working hard and fast. Previous research had shown a substantial effect on exhaustion in relation to psychosocial factors, which include loss of job control and social support (Steege et al., 2015). Furthermore, job stress may lead to burnout, a type of emotional and mental stress, depersonalisation and a reduced sense of personal performance (Lua & Imilia, 2015).

The physical demand domain showed that young, male and unmarried medical assistants with high weekly working hours have more physical stressors. Previous studies have reported that the differences between the healthcare providers' physical capacity are increasing age and musculoskeletal disorders, which have been identified in middle-aged workers (35-44 years) due to the physical demand in their work (Bulloch et al., 2017). According to Mc Carthy et al. (2018), a relationship between physical workload and job pressure has been seen, with senior healthcare providers reporting higher perceived physical workload stress. In addition, staff working the night shift are confronted by increased stress because of their heavier workload than those in the day shift, but at the same time, the stress level of healthcare providers was the same regardless of their age group (Sharifah Zainiyah et al., 2015).

5. CONCLUSION

In conclusion, most respondents reported having a better working condition, low in psychosocial stress but high in physical stress. The results also showed that young, male, single, and medical assistants have more physical demands. Healthcare providers who have long working hours (per week) also have high physical and psychological job demands. It is hoped that the authorities will be able to assist this target group. The staff's duration of working hours/week needs to be refined, and they need to be referred to a counsellor if they develop symptoms of stress and burnout.

Even though some of the findings showed a significant relationship among the variables, we could not provide a definitive conclusion due to the respondents' uneven data distribution. The limitation of this study arose when the majority of the sample were data from nurses, female, married and working in ICU. Therefore, it is suggested that further research should be carried out at a larger scale to determine the relationship between the healthcare providers from other populations in relation to the psychosocial and physical stressors. Further studies may be conducted in other departments such as medical, surgical or psychiatric, and healthcare providers in other urban hospitals.

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Appendix 1: Research instrument

Item	Job Content Scale	Reliability score	Source
Job control			
Q1	Learn new things		
Q2	Repetitive job		
Q3	Requires creativity		
Q4	Allows own decision	0.71	
Q5	High skill level		
Q6	Various work		
Q7	Lots of say		
Q8	Develop own abilities		
Psychological Job demand			
Q9	Work fast		
Q10	Work hard		
Q12	Conflicting demand	0.51	
Q13	Hectic work		
Q16	Free from pressure made by another		
Social Support			
Q19	Supervisor is a good organiser		
Q20	Supervisor pays attention		
Q21	Helpful supervisor		Amin et al., 2015
Q22	Supervisor is a good organiser	0.83	
Q23	Co-workers competent		
Q24	Co-workers interest in me		
Q25	Friendly co-workers		
Q26	Co-workers helpful		
Physical Demand			
Q11	Lots of physical effort		
Q14	Moving/lifting heavy loads		
Q15	Rapid physical activity		
Q17	Awkward body posture		
Q18	Awkward arms positions		
Q27	Lifting and lowering to or from the floor	0.84	
Q28	Lifting and lowering objects with shoulders		
Q29	Bending or twisting waist while working		
Q30	Pushing or pulling patients or objects		
Q31	Standing in the same position		
Q32	Repetitive movements with hands/wrists		
Q33	Applying pressure with hands/fingers		

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Determinants of Dividend Payout Ratio in the Malaysian Steel Industry

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ABSTRACT

The steel industry around the world is grappling with the effects of COVID-19. The demand growth in 2019 was slower than expected because of the continuing manufacturing recession in developed countries. In the first several months of 2020, other major steel manufacturers recorded a considerable reduction in exports. As a result of this, numerous policies were implemented during the pandemic to support downstream demand. The need arises due to the importance of measuring dividends among shareholders. However, other existing variables need to be studied. Therefore, the rationale of this study is to conduct an empirical analysis on the determinants of the dividend payout ratio of the steel industry in Malaysia. The four determinants identified in this study are profitability, liquidity, leverage, and firm size. Secondary data was collected from 20 steel companies listed in Bursa Malaysia (stock exchange in Malaysia) from 2008 until 2017. Using the regression analysis and Random Effect Model, findings revealed that profitability and liquidity have a positive and significant effect on the dividend payout ratio of the steel industry. In the meantime, firm size shows a positive yet insignificant effect on the dividend payout ratio. Meanwhile, leverage was discovered to have a negative and negligible effect concerning the dividend payout ratio. This study suggests that finance managers must develop a clear dividend policy that specifies the percentage of dividends paid and retained to keep existing shareholders and attract new investors. Moreover, it will also assist them in keeping their existing investors for a longer length of time and attracting new investors to mobilize funds for future initiatives.

1. INTRODUCTION

Dividend policy refers to a collection of rules that helps a firm determine how much of its profits can be paid out to its shareholders and retain in the company (Kumar, 2018). If the business generates income, it may either distribute the income as dividends or keep its revenue. Hence, the right proportion must be identified between the dividends and retained earnings, which allows the company to frame a sound dividend policy. For this matter, all corporations should determine their dividend payout ratio (DPR) as investment returns of either in capital or the companies' ownership. Considering higher DPR can attract more investors in making investments and lead to the companies' growth.

Odawa and Ntoiti (2015) described the DPR as a return of investment or earnings that shareholders will get. Profits made by a company can be reinvested or distributed as the DPR to the shareholders. Besides, Geetha and Karthika (2017) also stated that dividends are declared based on investment opportunities, rate of returns, cost of capital, and the value of the DPR that represent the stability of a company. Moreover, they have also stated that the value of dividends can enhance the company's image. Also, it may create trust among shareholders and potential investors, giving the impression that the company possesses good and stable financial standings. However, if the company does not follow the DPR, it may denote that the company faces financial issues. Alzomaia and Al-Khadhiri (2013) reported that dividends are used as a tool by investors to indicate if the dividend per share (DPS) drops and whether a firm's financial performance is in good condition or not. The issue was raised by Lin et al. (2018). They discovered that each company has a unique dividend payout policy, with decisions about the dividend payout typically made by the management team based on its performance and human-behaviour intervention.

The steel industry has become one of the most important industries worldwide, especially in developing countries. In Malaysia, this sector is the leading producer for the construction and industrial sectors. In recent news, the share prices of the local steel companies rallied over the past weeks and performed well in the third quarter of 2020 (Inn, 2020). Even though there are substitutes for steel-like wooden or plastic materials, they have not affected steel demand in construction or industrial. Even though the demand-and-production disruptions induced by the COVID-19 outbreak began to subside in the second half of 2020, the problem risks having long-term and substantial consequences for the steel industry. However, Mercier et al. (2020) reported that digitalisation, new technologies, and innovations have helped the steel industry mitigate the pandemic's impacts. As the Malaysian economy is experiencing rapid growth in the steel industry and technology, Krishnamoorthi and Vetrivelan (2016) acknowledged analysing factors that may impact the dividend payout policy. Previous studies have shown that dividends have benefited shareholders despite risks and investments. However, there are several other existing variables, which need to be studied too. Although there are studies on dividend theories and policies in Malaysia, the steel market is still underexplored and requires investigation for further evidence and references.

Dividends are desired because shareholders contribute to a company's capital to increase their wealth and obtain higher returns on their investments (Krishnamoorthi, 2016). As a result, both decisions are mutually beneficial, and no decision can be made without the others. Hence, this study focused more on examining the most significant factors that influence the dividend payout of the steel industry in the Malaysian market by analysing the suggested factors, namely profitability, liquidity, firm size, and leverage ratio, as the independent variables.

2. LITERATURE REVIEW

2.1 Dividend Payout and Steel Industries

Typically, it is beneficial to pay dividends in a company because it will give more returns and profits to the company. Such as attracting new investors, maintaining loyalty to existing shareholders, injecting more investments, and increasing income generated from the investments. However, Geetha and Karthika (2017) highlighted that higher dividends might lead to less provision of fund growth while higher retained earnings lead to low dividends, which are the return on investment that is not satisfied by the majority of shareholders. Therefore, all decisions complement each other, which means that no decision can be made independently without the other. A finance manager must devise a guiding dividend policy to assess the dividend payment and retention proportion that can maintain current shareholders and attract new investors (Krishnamoorthi & Vetrivelan, 2016).

Hence, in the present report, these potential improvements can be evaluated and employed to assess the dividend payout policy and the success of the selected steel companies in Malaysia. The steel industry was recorded as a booming sector due to its up-trending share prices. Aluminium demands are seeing a positive trend as other industries recover following the re-opening of other sectors after the global lockdown. In accordance with the yearly Economic Outlook Report 2021, this sector has grown to an estimated percentage of 13.9% due to significant infrastructure and affordable housing projects (Inn, 2020). Previous studies have also revealed that reinvestments in new technologies and diversification into new business areas are essential strategies for business expansion (Shapira, 2009).

2.2 Profitability

Several studies have demonstrated factors that contribute to the determinants of the dividend payout ratio. A recent study by Sarumpaet and Suhardi (2019) shown that, partially, profitability and liquidity variables have a positive effect on the dividend payout ratio. In deciding a company's dividend strategy, profitability plays a critical role. When a low level of investment opportunities and the debt ratio is present, a high level of earnings raises the tendency to pay more dividends. On the other hand, the dividends are adversely impacted in certain situations when the company's profits are increased (Arif & Akbar, 2013).

2.3 Liquidity

Liquidity measures the extent to which a firm can meet its payment obligations. Cash flow is considered a relevant measure of the firm's disposable income. Meanwhile, the liquidity ratio is used as a proxy to examine a relationship between a dividend policy and cash flow (Eng et al., 2013). Jiang et al. (2017) explained that stock liquidity provides information and increases insiders' incentives to pay dividends. They have also concluded that a positive relationship between stock liquidity and dividend payouts is more apparent when a conflict between shareholders and minority investors can be resolved well.

2.4 Leverage

Komrattanapanya and Suntrauk (2013) cited that companies face financial risks by using a high degree of debt-funding in their capital structures. Debt obligations and interest payments reduce the ability of the firms to have a residual income to guarantee dividend payments. Consequently, debts would negatively impact the dividends paid for a period (Tahir et al., 2020). To a certain

extent, a high amount of debt legally restricts the dividend distribution of the firms. It is normal for banks with a higher leverage ratio to be under more immense regulatory pressures (Eng et al., 2013). In Malaysia, Mui and Mustapha (2016) found a similar finding made by John and Muthusamy (2010) from India, revealing that leverage and dividend payout ratio plays an insignificant relationship.

2.5 Firm Size

Generally, bigger corporations tend to pay more significant dividends due to their stable profits (Arif & Akbar, 2013). Afza and Mirza (2010) affirmed that, because of companies' high asset values and robust growth prospects, these large corporations would get external finances; however, dividend payments do not decrease with high investment opportunities. On the opposite, the size of companies has a negative effect on dividends in certain countries; big businesses want to fulfil investment needs internally rather than externally. Rather than distributing the dividends, they keep the funds under their management. According to Arif and Akbar (2013), the payout policy of smaller and less profitable firms with more investment opportunities are major factors responsible for a decline in dividend behaviour. Table 1 shows the effect of independent variables on dividend payout policy from previous studies.

Table 1. Summary of the Previous Findings

Variable	Author(s)	Sign	Indicator
Profitability	Abu (2012)	Positive	Significant
	Arif and Akbar (2013)	Positive	Significant
	Komrattanapanya and Suntrauk (2013)	Positive	Significant
	Marfo-Yiadom and Agyei (2011)	Positive	Significant
	Odawa and Ntoiti (2015)	Positive	Significant
	Sarumpaet and Suhardi (2019)	Positive	Significant
	Mohamed Nasser et al. (2015)	Negative	Significant
	Rafique (2012)	Negative	Insignificant
	Saeed et al. (2014)	Positive	Insignificant
Liquidity	Eng et al. (2013)	Positive	Significant
	Mohamed Nasser et al. (2015)	Positive	Significant
	Jiang et al. (2017)	Positive	Significant
	Sarumpaet and Suhardi (2019)	Positive	Significant
	Saeed et al. (2014)	Positive	Significant
	Komrattanapanya and Suntrauk (2013)	Positive	Insignificant
	Abu (2012)	Negative	Significant
Leverage	Marfo-Yiadom and Agyei (2011)	Positive	Significant
	John and Muthusamy (2010)	Positive	Significant
	Mui and Mustapha (2016)	Positive	Significant
	Odawa and Ntoiti (2015)	Positive	Significant
	Ranti (2013)	Positive	Significant
	Mohamed Nasser et al. (2015)	Positive	Insignificant
	Alzomaia and Al-Khadhiri (2013)	Negative	Significant
	Komrattanapanya and Suntrauk (2013)	Negative	Significant
	Tahir et al. (2020)	Negative	Significant
	Eng et al. (2013)	Negative	Insignificant
	Rafique (2012)	Negative	Insignificant
Firm Size	Alzomaia and Al-Khadhiri (2013)	Positive	Significant
	Komrattanapanya and Suntrauk (2013)	Positive	Significant
	Rafique (2012)	Positive	Significant
	Ranti (2013)	Positive	Significant
	Arif and Akbar (2013)	Positive	Insignificant
	Mohamed Nasser et al. (2015)	Positive	Insignificant
	Odawa and Ntoiti (2015)	Negative	Significant
	Saeed et al. (2014)	Negative	Significant

3. METHODOLOGY

3.1 Research Design

This current research study aims to identify the most significant factors influencing the DPR policy of the 20 selected steel companies in Malaysia. One of the criteria of the sample selection includes those companies listed in Bursa Malaysia for 10 years. To achieve the objectives of this study, annual reports for a period starting from 2008 to 2017 were examined. Based on the availability of the data, 20 steel companies were chosen.

The primary data was taken from the respective firms' annual reports directly downloaded from the BURSA Malaysia website. In the interim, the financial data for the time frame chosen was collected from Thomson Reuters Data Stream. 20 steel companies were selected from 26 companies listed on BURSA Malaysia. Firms are chosen based on two criteria for the specific research. Firstly, the availability of the firms' annual reports for the period of 2008 to 2017. Secondly, the financial data availability of the required listed steel companies at BURSA Malaysia.

To recap, the purpose of this paper is to investigate the factors that influence the dividend payout. Thus, multiple regressions were used to forecast the value of each variable. The study has employed the multiple regression model to determine and evaluate the relationship between the variables and the dividend payout. The dependent variable denotes the dividend payout, and the independent variables denoted the remaining variables. This study focused on descriptive statistics and Pearson's correlation analysis results. In the interim, the test for multicollinearity was carried out before analysing the regression model. The study used the panel data regression analysis of the cross-sectional and time-series data. For the estimation purpose, the most common models that were conducted are the Pooled Ordinary Least Square (POLS) regression, Fixed Effects Model (FEM), and Random Effects Model (REM). Therefore, the Hausman test was conducted to see whether the FEM or REM is more appropriate.

3.2 Equation Model

The general model for the study is as follows:
$$DPR_{i,t} = \alpha + \beta_1 PROF_{i,t} + \beta_2 LIQ_{i,t} + \beta_3 LEV_{i,t} + \beta_4 SIZE_{i,t} + \varepsilon_{i,t} \tag{1}$$

The equation descriptions are as follows:
α : Constant
DPR   : Dividend payout ratio (percentage)
PROF   : Profitability (percentage)
LIQ   : Liquidity ratio (percentage)
DTE   : Debt to equity/Leverage (percentage)
SIZE   : Firm size (percentage)
ε : Error term
i   : Sample unit of panel
t   : Time of period

4. DATA ANALYSIS AND RESULTS

4.1 Descriptive Statistics

Table 2 shows the summary of the descriptive statistics that comprise the measures of central tendency. The DPR recorded the highest standard deviation, which indicates that it has the highest variability of the data. As shown by the mean, lower profitability can lead to fewer

profits gained by the companies as lower profitability means that the companies' performances may lead to unhealthy financial conditions.

Table 2. Descriptive Statistics

Variable	DPR	PROF	LIQ	LEV	SIZE
Maximum	65.00	0.19	22.80	4.37	22.79
Minimum	0.00	-0.30	0.22	0.03	18.33
Mean	3.25	0.02	3.13	0.98	20.14
Std. Deviation	6.46	0.05	4.37	0.77	1.10

4.2 Pearson's Correlation Analysis

Table 3 shows that there is no multicollinearity issue in the study. The numerical data of the correlation coefficient between the two independent variables for all the independent variables are lesser than 0.8. Meanwhile, leverage (LEV) has a negative relationship with the DPR, while profitability (PROF), liquidity (LIQ), and firm size (SIZE) display a positive relationship with the dividend payout ratio. The variance inflation factor (VIF) test was carried out to confirm no presence of multicollinearity problems.

Table 3. Pearson's Correlation

Variable	DPR	PROF	LIQ	LEV	SIZE
DPR	1.000				
PROF	0.343	1.000			
LIQ	0.351	0.335	1.000		
LEV	-0.146	-0.286	-0.470	1.000	
SIZE	0.028	-0.189	-0.151	0/270	1.000

4.3 Variation Inflation Factor

Multicollinearity can exist when the variables reflect similar factors, which can be traced when the mean value of the variance inflation factor (VIF) is more than 5. Based on the result shown in Table 3, the mean VIF is 1.25, lower than 5.00. Thus, it signifies that there is no multicollinearity problem existing in this study.

Table 4: Variation Inflation Factor

Variable	VIF	1/VIF
PROF	1.38	0.7268
LIQ	1.36	0.7352
LEV	1.17	0.8547
SIZE	1.09	0.9136
Mean VIF	1.25	

4.4 Pooled Ordinary Least Square Regression Analysis

The value of the coefficient for profitability shows a positive relationship with the DPR. This condition reflects that if there is a 1% increase in profitability, the DPR will increase by 32.59%. Also, it was found that liquidity, leverage, and firm size has a positive relationship with the DPR, which indicates that a 1% increase in liquidity, leverage and firm size will increase the DPR by 0.435%, 0.338%, and 0.672% respectively. On the other hand, the probability, denoted by the *p*-values, shows that those three variables are significant for this study: profitability, liquidity, and firm size. The *p*-values of these three variables are at the 1%, 5%, and 10% significant levels, respectively. The *p*-value for leverage is 0.592, which is above the value of

the significant level. Thus, indicating that this variable is not significant at the levels of 1%, 5%, and 10%.

Table 5. Pooled Ordinary Least Square Regression Results

DPR	Coefficient	Std Error	Z	P>|z|	95% Conf	Interval
PROF	32.5976	8.1695	3.99	0.000***	16.4856	48.7096
LIQ	0.4350	0.1108	3.93	0.000***	0.2165	0.6535
LEV	0.3387	0.6302	0.54	0.592	-0.9042	1.5817
SIZE	0.6729	0.3958	1.70	0.091*	-0.1077	1.4535
_cons	-12.6426	7.9161	-1.60	0.112	-28.2549	2.9693
No of obs	200					
Prob > chi2	0.0005					

Notes: The dependent variable is the dividend payout ratio (DPR). Meanwhile, the independent variables are defined as follows: profitability (PROF), liquidity (LIQ), leverage (LEV), and firm size (SIZE).
*Significant levels: 0.10 = * significant; 0.05 = **moderately significant; 0.01 = ***most significant.*

4.5 Random Effect Model Regression Analysis

The Random Effect Model (REM) determines a significant relationship between the dependent variable and independent variables. Based on the results displayed above, leverage (LEV) was discovered to have a negative relation (Alzomaia & Al-Khadhiri, 2013; Eng et al., 2013; Komrattanapanya & Suntrauk, 2013; Ranti, 2013) but insignificant with the DPR, which is in line with Rafique (2012). The study has found that every 1% increase in profitability (PROF) will increase the DPR by 23.23%. Therefore, the companies can pay more dividends together with high profitability for those particular years. Thus, the result of liquidity shows a significant, positive relationship with the DPR, which is consistent with the results generated by Eng et al. (2013) and Saeed et al. (2014). Another positive, significant result is profitability (PROF), which was suggested by Abu (2012), Arif and Akbar (2013), Komrattanapanya and Suntrauk (2013), Marfo-Yiadom and Agyei (2011), and Odawa and Ntoiti (2015). Besides, it was discovered that firm size has a positive relationship with the DPR, which was in line with Alzomaia and Al-Khadhiri (2013), Komrattanapanya and Suntrauk (2013), Rafique (2012), and Ranti (2013). However, firm size demonstrates an insignificant relationship with the DPR (Arif & Akbar, 2013).

Table 6. Random Effect Results

DPR	Coefficient	Std Error	Z	P>|z|	95% Conf	Interval
PROF	23.2376	8.0485	2.89	0.004***	7.4627	39.0124
LIQ	0.3107	0.1266	2.45	0.014**	0.0626	0.5588
LEV	-0.0600	0.6732	-0.09	0.929	-1.3795	1.2595
SIZE	0.5124	0.5342	0.96	0.337	-0.5347	1.5595
_cons	-8.4453	10.7057	-0.79	0.430	-29.4280	12.5375
No of obs	200					
Prob > chi2	0.0005					

Notes: The dependent variable is the dividend payout ratio (DPR). Meanwhile, the independent variables are defined as follows: profitability (PROF), liquidity (LIQ), leverage (LEV), and firm size (SIZE).
*Significant levels: 0.10 = * significant; 0.05 = **moderately significant; 0.01 = ***most significant.*

4.6 Breusch and Pagan Multiplier Test

The Breusch and Pagan Multiplier Test signify that the Prob > chi2 is 0.0000, which is below 0.05; therefore, the alternate hypothesis (the Random Effect Model) was accepted while the null hypothesis (the Pooled OLS Model) was rejected.

4.7 Final Estimation

$$DPR_{i,t} = -8.4453_{i,t} + 23.2376PROF_{i,t} + 0.3107LIQ_{i,t} - 0.060LEV_{i,t} + 0.5124SIZE_{i,t} + \varepsilon_{i,t}$$

The regression model above illustrates the regression model of the DPR in profitability, liquidity, leverage, and firm size of the Malaysian steel industry as the independent variables. Based on the model, if the other variables remain constant, the DPR will decrease by 8.44%. The profitability value validates a positive relationship with the DPR, which means that if there is a one percent increase in profitability, the DPR will increase by 23.23%. Furthermore, the coefficient value for liquidity shows a positive relationship with the DPR, suggesting that if there is a one percent increase in liquidity, the DPR will increase by 0.31%. However, the coefficient value for leverage shows a negative relationship with the DPR, which means that a one percent increase in leverage will decrease the DPR by 0.06%. Lastly, the firm size reveals a positive relationship with the DPR, which means that if there is a one percent increase in firm size, the DPR increase by 0.51%. Table 7 below concludes that the final results of this study are synchronous with those of the previous studies and support the hypothesis decisions.

Table 7. Summary of Analysis

Variables	Findings	Author(s)
Profitability	Positive and significant	Abu (2012) Arif and Akbar (2013) Komrattanapanya and Suntrauk (2013) Marfo-Yiadom and Agyei (2011) Odawa and Ntoiti (2015) Sarumpaet and Suhardi (2019)
Liquidity	Positive and significant	Eng et al. (2013) Mohamed Nasser et al. (2015) Jiang et al. (2017) Sarumpaet and Suhardi (2019) Saeed et al. (2014)
Leverage	Negative and insignificant	Eng et al. (2013) Rafique (2012)
Firm Size	Positive and insignificant	Arif and Akbar (2013) Mohamed Nasser et al. (2015)

5. CONCLUSION

The main focus of the study is to discover the influence of profitability, liquidity, leverage, and firm size on the DPR of the steel industry in Malaysia for ten years. Several factors can influence the DPR; however, they can be very volatile in the steel industry. Hence, it is recommended that future researchers use earnings per share and a microeconomic variable, a gross domestic product because this industry is susceptible to these economic factors.

In conclusion, due to the positive correlation between firm profitability and dividend policy, it is recommended that firm management teams increase sales and decrease expenditures. Secondly, both stock-market regulators and managers are advised to enforce the dividend-signalling theory as the firm's market value should be increased. It is also highly recommended that profitability and liquidity ratio consider the factors that affect the decision-making of paying dividends as the board of directors will decide based on the companies' profits and the ability of the companies to pay their debts using the current ratio. Thus, the companies' high profits and liquidity ratio may positively impact the dividends. A strong liquidity ratio may affect the dividends as the companies can pay their short-term obligations. Therefore, the companies should efficiently increase their profitability to raise or maintain the dividend payment to their shareholders. The high liquidity ratio is suitable for the companies as it denotes that they can afford to pay any liabilities in the short term. As the final result shows that the liquidity ratio has a significant impact, the companies should focus more on profitability (investments) and liquidity. Finally, this study vouches for leverage or debt-equity ratio to be optimal, thus enabling the companies to pay their debts. It allows them to be in a position to pay dividends to their shareholders. The study has several limitations that can be addressed by future research. Future researchers are urged to consider additional factors affecting dividend policies, such as liquidity, corporations' age, and industry. Due to the quantitative nature of this study, future researchers are also advised to consider using qualitative data.

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The Effect of Stress on Distance Learning Nursing Degree Students: A Cross-Sectional Study

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ABSTRACT

Nursing is acknowledged to be a stressful profession worldwide. Being a nurse and a student at the same time is a considerable challenge. Many part-time students experienced stress as they complete their studies. This study aims to investigate the level of stress among e-PJJ nursing degree students. It also seeks to identify the causes and effects of stress on the students. This study applied a quantitative cross-sectional study design. Purposive sampling was used to select the target population of 96 e-PJJ nursing degree students at UiTM Selangor, Puncak Alam campus. The participants included all nursing degree students who were enrolled in a flexible learning course. This study was conducted between January 2019 and January 2020. The study showed most of the respondents had mild stress to severe stress. Headache was identified as the most common effect of stress, while the less common effect is drastic weight loss. Two significant academic factors, feeling stressed as the submission deadline neared and sitting for the examination, were the most influential in causing stress. The one-way ANOVA found statistical differences between the number of children and the stress level. A Tukey post hoc test revealed that those with two children have a significantly higher level of stress, followed by those with one child and those with four children. In conclusion, this study found that most e-PJJ nursing degree students experienced stress, mainly at a low level. Well-managed stress is essential in ensuring part-time students can succeed both in their work and studies.

1. INTRODUCTION

Nursing education in Malaysia is undergoing continuous major transformation at a more advanced level. Implementation and constant professional development practices are seen as an advancement of practice in the nursing profession. On the other hand, with the support of higher authority, there have been many universities that offer undergraduate courses in nursing with flexible study time or part-time distance study. This career advancement does not come easily. A lot of hard work and sacrifice are contributed to achieving success. It should be noted that previous studies have indicated that the undergraduate nursing education system is evident in putting students through a stressful phase (Brown et al., 2016).

Distance learning or part-time students involved in this profession deal with stress in the workplace and their studies. It is clear from the extensive evidence in the literature that nursing is acknowledged to be a stressful profession worldwide (Lim et al., 2010). The research study by Ugwoke et al. (2018) also found that academic stressors are consistently highly ranked in studies where participants are associated with packed schedules, busy juggling study, and work-life, including extracurricular activities. These activities can take a toll on the physical and mental health of the students, mainly if they do not get enough rest or sleep. If left untreated, these stressors can compound over time, leading to even greater levels of stress. There is ample evidence supporting the pressure of working and studying at the same time. Preparing for examinations and acquiring professional knowledge, skills, and attitudes were reported as the most stressful aspects of the medical or health profession training by Kulsoom (2015) as many skills and knowledge need to be acquired in a short period.

Stress is produced through an individual's interaction with their environment due to their evaluation of their ability to cope with a demanding situation that exceeds the resources available to them, thus endangering their physical, psychological, and emotional well-being (Lyon, 2012). Stress may result in adverse health effects, low achievement in their studies, and low job performance. Previous studies have indicated that one-third of all college students ranked "stress" as the highest health affecting symptoms which caused anxiety, depression, and poor sleeping pattern (Ugwoke et al., 2018). Stress in students occurs when they need to juggle between work and studies, where both aspects require goals and objectives that need to be met quickly. Apart from that, identifying stressors and the stress level is very important in maintaining a part-time student's lifestyle. Evans et al. (2007) reported that previous studies showed that preparing assignments for submission and juggling between work commitments and study were items with the highest stress ratings with 94.0% and 92.9%. Other potential stressors included workload, completing assignments (51%), and the writing demands at the necessary academic level (32%). In addition, headache and sleep disturbance were the most common symptoms of stress. People are usually unaware and do not notice that they are under stress until it is too late, as the signs may not be obvious initially. In maintaining a healthy lifestyle, it is vital to be aware of and notice all stress symptoms from the beginning and treat them with appropriate stress coping methods.

Stress among nurses is evident in the literature on nursing, but there is little information on the specific stressors that affect registered nurses undertaking further academic studies (García & Ayala, 2017). Therefore, this study aims to investigate the level of stress among e-PJJ nursing degree students. It also seeks to identify the main stressors that contribute to stress among e-PJJ nursing degree students. Knowing the symptoms of stress and the factors that may predispose to stress could help students reduce or prevent stress-related incidences. Early detection could be made so that prevention and coping measures can be taken.

2. METHOD

2.1 Study Design, Location, and Sampling

This study was based on a quantitative cross-sectional study design. The study was conducted at the Faculty of Health Sciences, UiTM Selangor, Puncak Alam campus. The targeted population for this study was the e-PJJ nursing degree students. In this study, the operational definition for e-PJJ is an e-learning system that offers working adults to engage in a distance learning programme. A purposive sampling method was used where 96 students were chosen from a sample of students in total. Each of the respondents was selected according to each group's name list according to inclusion criteria and asked whether they are willing to participate in this study or not.

Sampling size was determined using the formula table develop by Krejcie and Morgan (1970). Based on the formula table, the sample size required is 96 students. Ethical clearance had been obtained from Research Ethics Committee UiTM: 600-IRMI (5/1/6). All the respondents who took part in this study were given a subject information sheet and consent before distributing the questionnaire. The study protocol, including the documentation data and all other information generated, is strictly confidential. No information will be released to any unauthorized third party without prior written approval.

2.2 Research Instrument

A two-section questionnaire was used for data collection. Section A was to gauge demographic data. It consists of six questions to gather respondents' demographic data, including gender, age, marital status, number of children, monthly income, and current semester. Section B presented the Student Stress Inventory (SSI), with 40 items adapted from Mohamed Arip (2016). The SSI consisted of two-part; Part I measured the effect of stress, consisting of 10 items, while Part II consists of three subscales to determine the level and cause of stress among students. The three subscales are Interpersonal Relationship, Academic, and Environmental. Each part was measured using the Likert scale where the designed ordinal scale of "Never-1," "Somewhat Frequent-2," "Frequent-3," and "Always-4" is used. The value mark given for each choice is 1 for "Never," 2 for "Somewhat Frequent," 3 for "Frequent," and 4 for "Always." Finally, scores for all items will be calculated to see which subscale gave the highest scores. All scores for each subscale will be totalled to determine the stress level. It is suggested that those who obtained a score between 122 to 160 reflected having "severe stress," whereas a score between 81 to 121 reflected having "moderate stress," and those who obtained a score of 40 to 80 were having "mild stress." The administration process took approximately 15 to 20 minutes.

2.3 Statistical Analysis

Data collected was analysed by using IBM SPSS version 25.0. Demographic data, stress level, causes, and effects of stress were analysed using descriptive statistics with means, standard deviations, frequencies, and percentages. Independent t-test and one-way ANOVA were used to determine the relationship and differences between sociodemographic factors with the level of stress. The accepted significance was set at $p<0.05$.

3. DATA ANALYSIS AND RESULTS

3.1 Demographic Data

As shown in Table 1, the highest percentage of participation in this study was 89 females (93%), followed by seven males (7%). Most of the participants were those in the age range of 31-40, with 65 (68%) participants. Besides that, more than half of the participants were married, with 63 (66%) participants and only 2 (2%) were widowed. A total of 51 (53%) participants has one child, and only 4 (6%) have more than five children. Most of the participants in this study have a monthly income between RM 4,000.00-6,000.00 (58%).

Table 1. Sociodemographic Characteristics of e-PJJ Nursing Degree Students

Demographic	Frequency	%
Gender		
Male	7	7
Female	89	93
Age		
20-30	25	26
31-40	65	68
41-50	5	5
≥ 51	1	1
Marital status		
Married	63	66
Single	31	32
Widowed	2	2
No. of child		
1	51	53
2	26	27
3	9	9
4	6	6
5 ≥	4	4
Monthly income (MYR)		
1000 - RM3000	36	38
4000 – RM6000	58	60
7000 – RM9000	2	2
≥ 10000	0	0

3.2 Stress among e-PJJ Nursing Degree Students

The results from the Student Stress Inventory (SSI) for this study are shown in Table 2. The total mean (SD) score for SSI was 74.79 (16.79), whereby the maximum score was 128, and the minimum score was 40.

Table 2. Level of Stress among e-PJJ Nursing Degree Students (N=96)

Variable	Mean	SD	Min	Max
Total Score SSI	74.79	16.79	40	128
Subscale score				
Physical	18.57	4.71	10	29
Interpersonal Relationship	15.33	4.73	10	35
Environment	20.82	6.52	10	36
Academic	20.05	5.85	10	36

Table 3 shows the level of stress by categories. The result showed that the majority of students have *"mild stress"* 67.7% (n=65), followed by *"moderate stress"* with 29.2% (n=28), and only 3.1% (n=3) of the students experienced *"severe stress."*

Table 3. Level of Stress among e-PJJ Nursing Degree Students (*N*=96)

Level of Stress	Frequency (*n*)	Percentage (%)
Mild	65	67.7
Moderate	28	29.2
Severe	3	3.1

3.3 Effect of Stress among e-PJJ Nursing Degree Students

Table 4 presents the responses on the effect of stress. The result obtained indicated that *"headache"* is the most significant effect of stress, with a mean (SD) score of 2.36 (0.88). Also, students indicated other physical symptoms, including *"back pain"* with a mean score of 2.31 (0.87), *"constant tiredness or fatigue"* with a mean of 2.16 (0.86), and *"sleep problem"* with 2.10 (0.92). The three lowest mean (SD) score was for *"sweating or sweaty hands"* with a mean score of 1.53 (0.632), *"difficulty breathing"* with a mean score of 1.38 (0.72), and *"drastic weight loss"* with a mean score of 1.34 (0.72).

Table 4. Mean and Frequency Effects of Stress for Each Item (*N*=96)

Effect of Stress	Mean	SD	Frequency			
			Never	Somewhat Frequent	Frequent	Always
Total Effect of Stress	18.57	4.71				
Subscale effect of stress						
Physical Symptoms						
Headache	2.36	0.88	14	45	25	12
Back pain	2.31	0.89	14	51	18	13
Sleep problem	2.10	0.92	27	41	19	9
Difficulty breathing	1.38	0.72	71	16	7	2
Excessive worry	2.03	0.83	26	46	19	5
Stomach pain and nausea	1.56	0.74	56	26	14	0
Constant tiredness or fatigue	2.16	0.86	20	50	17	9
Sweating or sweaty hands	1.53	0.63	52	37	7	0
Frequently cold	1.79	0.83	43	32	19	2
Drastic weight loss	1.34	0.72	75	11	8	2

3.4 Main Causes That Lead to Stress among e-PJJ Nursing Degree Students

Table 5 shows the causes of stress among the e-PJJ nursing degree students. It is clear that the highest causes of stress from the *"Interpersonal Relationship"* subscale are for item "I feel guilty if I fail to fulfil my parent's hope," which was 63.5 %. The lowest percentage was for the item *"My families are not supportive,"* with 13.5%. Thus, these findings show that the majority of the students feel obliged to fulfil their parents' aspirations and will most likely strive to achieve them causing additional stress even though their families are supportive. Furthermore, for the *"Environmental"* subscale, the highest percentage was 90.6% for item "I feel scared being in an insecure place," and the lowest percentage is 21.9% for item *"I have a transportation problem."* These findings revealed how well the e-PJJ students are at adjusting to the social environment and how high or low their resiliency level is. However, for the *"Academic"* subscale, the findings showed that most e-PJJ students, or 90.6% of them, agreed with the item

"I feel stressed as the submission deadline neared," and the lowest percentage is for item *"I lost interest in the course"* at 43.8%. For academic causes, these findings show whether the e-PJJ students are high or low achievers, possess high or low self-motivation, and are poor or good in time management.

Table 5. Causes of Stress among e-PJJ Nursing Degree Students

Item	Frequency	(%)	Rank
Interpersonal Relationship			
I feel guilty if I fail to fulfil my parent's hope	61	63.5	1
My parents wish only for my success	61	63.5	1
I feel frustrated by the lack of faculty management	40	41.7	2
I find it difficult to meet my parent's high expectation	40	41.7	2
My parents treat me as a helpless person	36	37.5	3
I find it difficult to get along with group mates in doing the academic task	36	37.5	3
I feel disturbed when having a problem with my boyfriend/girlfriend	28	29.2	4
My friends did not care about me	24	25	5
My lecturers/teachers are not supportive	22	22.9	6
My families are not supportive	13	13.5	7
Environmental			
I feel scared being in an insecure place	87	90.6	1
Crowding makes me feel uneasy	77	80.2	2
Hot weather makes me avoid going out	76	76.2	3
Messy living conditions distracted me	73	76.0	4
Pollution makes me uneasy	68	70.8	5
Waiting in a long line makes me feel uneasy	66	68.8	6
The surrounding noise distracted me	52	54.2	7
I feel frustrated with inadequate campus facilities	45	46.9	8
I feel stressed with the bad living condition of my home	21	21.9	9
I have a transportation problem	21	21.9	9
Academic			
I feel stressed as the submission deadline neared	87	90.6	1
I feel stressed to sit for the examination	87	90.6	1
I feel nervous delivering the class presentation	77	80.2	2
I feel stressed dealing with difficult subjects	76	79.2	3
I feel burdened by academic workloads	70	72.9	4
I feel difficulty in handling my academic problem	65	67.7	5
I find it difficult to juggle time between study and society involvement	61	63.5	6
I have a financial problem because of the expenses of the university	58	60.4	7
I find it difficult to juggle time between study and social activity	56	58.3	8
I lost interest in the course	42	43.8	9

3.5 Sociodemographic Factors and the Level of Stress.

An independent t-test was conducted to compare the demographic factors versus the level of stress. Table 6 presents the finding that there were no significant differences in the stress levels of males with a mean of (SD) of 75.66 (24.9) and female 76.68 (15.7), $t(94) = 0.176$, $p > 0.05$. A one-way ANOVA was conducted to compare the differences in the level of stress with age, marital status, number of children, and monthly income. However, the result showed no significant differences between these variables, in which the *p*-value >0.05. However, there were statistical differences between the number of children as determined by one-way ANOVA $[F (4, 91) = 8.062, p=0.000]$. A Tukey post hoc test revealed that those who have two children have a significantly higher level of stress with a mean (SD) of 87.80 (19.7), followed by those who have one child 71.92 (11.4), and four children 60.0 (11.0). There is no significant difference between those who have three, five, or more children. This shows that students with two children experience a significantly higher stress level than those with different numbers of children.

Table 6. The Relationship between Sociodemographic Factors with the Level of Stress

Demographic (*n*)	Mean (*SD*)	*t*-statistics (df)	*p-value*
Gender			
Male	(75.66, 24.9)	0.176 (94)	0.860[a]
Female	(76.68, 15.7)		
Age (years)			
20-30 (25)	80.20 (14.5)		
31-40 (65)	72.68(17.3)	1.427 (2,92)	0.240*
41-50 (5)	72.80 (18.0)		
≥ 51 (1)	87.00 (0.00)		
Marital status			
Married (63)	76.88 (18.4)		
Single (31)	71.09 (12.9)	1.534 (2,93)	0.221*
Widowed (2)	66.00 (0.00)		
No. of child			
1(51)	71.92 (11.4)		
2 (26)	87.80 (19.7)		
3 (9)	68.11 (17.28)	8.062 (4,91)	0.000***
4 (6)	60.00 (11.0)		
5 ≥ (4)	64.00 (13.9)		
Monthly income			
RM1000 - RM3000 (36)	79.47 (14.6)		
RM4000 – RM6000 (58)	72.24 (17.7)	2.523 (2,93)	
RM7000 – RM9000 (2)	64.50 (0.71)		0.086*
≥ RM10000 (0)			

an independent t-test
*one-way ANOVA
***Post hoc analysis: Students with two children perceive stress at a significantly higher level than those with a different number of children.

Figure 1 shows that those respondents with two children perceived stress at a visibly higher level than those with a different number of children.
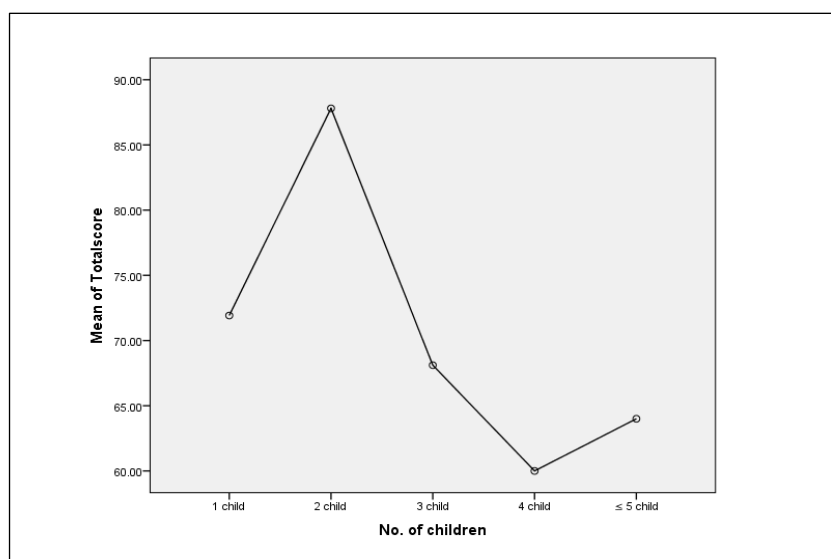

Figure 1. Means Plot of Total Score to Numbers of Children

4. DISCUSSION

The study aims to determine the stress level, causes, and effects among e-PJJ nursing degree students. For the level of stress, it was found that most students do experience stress, and the majority of them just experienced mild stress. These findings are quite similar to what has been found previously by Waghachavare et al. (2013). Researchers found that only 24.4% of respondents perceived stress, and only 14.4% experienced moderate to severe stress. These show that student stress is a common problem in student life. From this study, researchers can conclude that students can manage stress well as most of the students only perceived mild stress. Even though stress was not so prominent, the stress is still there, perceived at a lower level. Only a few students experienced moderate and severe stress compared to mild stress. However, untreated stress could worsen in time, and the degree of stress can intensify. Stress that persists for an extended period may negatively affect students' academic achievement and health status. By 2020, the World Health Organization predicts that stress-related diseases would be one of the top causes of disability.

This study has shown that stress affects students primarily by giving them *"headaches"* and *"back pain,"* where more than 80% of the students experienced them during stress. The finding is consistent with past studies by Evans et al. (2007) and Lyon (2012), which reported that headache is the most common problem due to stress. Moscaritolo (2009) presented *"excessive worry"* as the most common effect, followed by "*headache"* and *"sleep problems,"* and she also found that only 71.9% of students experience sleep problems, while *"excessive worry"* stands at 72.9% and "constant tiredness or fatigue" at 79.2%. These four significant problems are the most common effect of stress found in this study. In contrast, the least common effects were *"breathing difficulties"* and *"drastic weight loss,"* where only 26.0% and 21.9% of students experienced them, respectively. This study found that most of the stresses were caused by academic factors where most of them felt stressed when the submission deadline of assignments neared and when they must sit for the examination.

A study by Abd El-Aziz et al. (2019) pointed out that most nursing students reported experiencing moderate stress due to transportation, academic, interpersonal, and social factors. This study found that environmental factors were among the main contributors, academic and interpersonal relationship factors. These findings also support the result from the study by Sahari et al. (2012), which concluded that the environmental factor is the major contributing factor in stress on students, especially part-time students. The authors also mentioned that uncomfortable living conditions at home were among the main factors contributing to stress among students. In this study, *"feeling scared being in an insecure place"* was at the top rank of the environmental factor. In contrast, *"bad living condition at home"* shares the lowest rank with the "*transportation problem."* The environment plays a significant role that affects the students' stress level as one's life is affected by their surrounding environment, which was also consistent with the findings of Essel and Owusu (2017). Changing of living or surrounding environment can also cause some stress to the students. As an e-PJJ student, adjustments to the environment, living conditions, or lifestyle might need to be made to meet study requirements. Some students learn to adapt to a new environment, while others might find it stressful. The environment can affect stress in human beings. A good and healthy environment can leave positive impacts on people, as much as an unhealthy environment can cause problems and eventually stress. In terms of environmental stress, people can change their environment by moving to another place, cleaning their surroundings, or improving them. For the academic factors, this study shows that *"feeling stressed as submission deadline neared"* and *"feeling stressed to sit for the examination"* were rank as the top academic stressor. These findings

suggest that the first step to learning how to better cope with stress is to identify what causes stress in the first place. Essel and Owusu (2017) found *"preparing assignments for submission," "doing the course assignments," "the demands of writing an assignment to the necessary level," "the prospect of the final examination,"* and *"preparing for the course examination"* are all ranked as leading stressors which were significant in their study. These also show that the academic structure varies in different universities.

Some universities are aware of the *"course workload"* contributing to students' stress levels and have lightened the academic workload. However, interpersonal relationship factors were the less contributing factor in predisposing stress among students. A study by Timmins and Kaliszer (2002) also compares academic factors with interpersonal relationship factors. Some degrees of stress were reportedly caused by the relationship with lecturers and clinical placements coordinators, but most students do not report stress from interpersonal relationships factors. This study found that in terms of interpersonal relationship factors, most of the students, or 63.5%, felt stressed when they might fail to fulfil their parents' hope or were unable to grant their parents' wish for their success in their study. The *"relationship with lecturers"* factor was given the second-lowest rank in this study as a factor that causes stress among students. Only 22.9% of students felt stress because of their relationship with their lecturers. This shows that most students have a good relationship with their lecturers and teaching personnel.

This study found no significant relationship between most sociodemographic factors in determining the relationship between sociodemographic factors and stress level. However, there is a significant relationship between the number of children with the level of stress. This is probably because those with more children have already established their family and have enough experience in taking care of their family. In comparison, those with fewer children were just about to start their families with minimal experience.

5. CONCLUSION

In conclusion, this study shows that most e-PJJ nursing degree students experienced stress at a low level. It is normal to face challenges and difficulties juggling between family, work, and studies as a student. The stress level among the respondents in this study was between low to moderate. Stress among university students cannot be eliminated. Still, a lot should be done to prepare students to positively manage stress to maximize their opportunities to effectively learn and grow during their student life and achieve success in academic and social environments. Appropriate actions should be taken, especially at the university level, to ensure that the stress level is well controlled and kept at a low level to help them manage their studies and work effectively. In the future, a similar study can be done on other course groups or faculty to assess the presence of stress and to investigate the cause and effect in different settings in comparison to this study. The study can even be conducted in various universities to compare the results and collaborate to solve the problem. The study can also be done in a more significant setting or with a broader population to acquire more persistent and accurate data to construct prevalent measures to reduce stress among students.

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APPENDIX

Appendix 1: Survey Instrument

Variables	Item Code	Item	Reliability Score	Source
Stress Assessment				
Effect of Stress	ES1	Headaches	0.920	
	ES2	Back pain	0.920	
	ES3	Sleep problem	0.921	
	ES4	Difficulty breathing	0.922	
	ES5	Excessive worry	0.919	
	ES6	Stomach pain and nausea	0.920	
	ES7	Constant tiredness or fatigue	0.919	
	ES8	Sweating or sweaty hands	0.920	
	ES9	Frequent cold/flu/fever	0.921	
	ES10	Drastic weight loss	0.922	
Cause of Stress				
Interpersonal Relationship	IR1	I find difficult to meet my parent's high expectation	0.918	
	IR2	My parents treat me as a helpless person	0.920	
	IR3	I feel guilty if I fail to fulfil my parent's hope	0.919	
	IR4	My parents wish only for my success	0.920	
	IR5	I find it difficult to get along with group mates in doing academic task	0.920	
	IR6	My friends did not care about me	0.918	
	IR7	I feel disturbed when having problem with my boyfriend/girlfriend	0.919	
	IR8	My families are not supportive	0.920	
	IR9	My lecturers/ teachers are not supportive	0.920	Mohamed
	IR10	I feel frustrated by the lack of faculty management	0.923	Arip (2016)
Academic	AC1	I have a financial problem because of the expenses of the university	0.919	
	AC2	I find difficult to juggle time between study and social activity	0.917	
	AC3	I feel nervous delivering the class presentation	0.918	
	AC4	I feel stressed as submission deadline neared	0.918	
	AC5	I feel stressed to sit for examination	0.916	
	AC6	I find difficult to juggle time between study and society involvement	0.918	
	AC7	I loss interest towards courses	0.917	
	AC8	feel burden of academic workloads	0.917	
	AC9	I feel stressed dealing with difficult subject	0.918	
	AC10	I feel difficult in handling my academic problem	0.917	
Environmental	EV1	I have transportation problem	0.921	
	EV2	I feel stressed with the bad living condition of my home	0.919	
	EV3	The surrounding noise distracted me	0.918	
	EV4	Pollution makes me uneasy	0.917	
	EV5	Hot weather makes me avoid going out	0.919	
	EV6	Messy living conditions distracted me	0.919	
	EV7	I feel frustrated with inadequate campus facilities	0.918	
	EV8	Crowding makes me feel uneasy	0.918	
	EV9	Waiting in a long line makes me feel uneasy	0.917	
	EV10	I feel scared being in an insecure place	0.920	

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A Descriptive Study on Standalone Risk Management Committee Adoption among the Top 50 Malaysian Firms

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ABSTRACT

In a modern business environment, business is considered more fragile as compared to the traditional business setting due to technology sophistication and global market uncertainty. Firms cannot run away from managing unique and complicated risk issues when exploring greater opportunities for a higher return in a competitive market. Realizing this, the Securities Commission of Malaysia had encouraged large, listed firms to form a separated Risk Management Committee to ensure better anticipation and responsiveness towards risk management issues. However, this practice is still voluntary among Malaysian listed firms most probably to allow internal coordination among different business atmospheres. Hence, this paper aims to describe the adoption level of the best practices to establish a standalone Risk Management Committee among the top 50 largest listed firms in Bursa Malaysia. Given the issuance of the Malaysian Code of Corporate Governance 2017 before the attributes of the Risk Management Committee were further explored. Secondary data were adopted, and information was gathered from the firms' annual reports in 2018 and 2019. It is available on the Bursa Malaysia website and each sampled firm's website. The results revealed that more than half of Malaysian listed firms had taken the initiative to establish a standalone Risk Management Committee following the best practices recommended by the Malaysian Code of Corporate Governance 2017. However, the composition of Risk Management Committee members is heavily tied to the Audit Committee. This current study provides insight into the risk governance structure among Malaysian listed firms after issuing the Malaysian Code of Corporate Governance 2017.

1. INTRODUCTION

Governance mechanism is one of the pillars of good corporate governance. The focus is mainly on how the board of directors, as the agent to the stakeholders, undertake their stewardship function in fulfilling their public accountability (Ishak & Mohamad Nor, 2017). Unforeseen failure of corporate firms such as Enron, WorldCom and Lehman Brothers has changed stakeholder's perspective on the importance of mitigating risk within a business entity (Abdullah, Shukor, & Rahmat, 2017; Aldhamari, Nor, Boudiab, & Mas' ud, 2020; Larasati, Ratri, Nasih, & Harymawan, 2019; Rimin, Bujang, Wong Su Chu, & Said, 2021). Policymakers are finding ways to enhance governance rules to safeguard stakeholders' interests as the starting point to minimize principal risk.

In Malaysia, with the recent corporate failure of 1Malaysia Development Berhad, the Securities Commission (SC) had launched an improvised version of its corporate governance best practices with the issuance of the Malaysian Code of Corporate Governance (MCCG) 2017, which superseded its earlier version. This fourth version is seen to strengthen corporate governance culture in line with market and business needs. One of the recommendations made by the SC in the Step-Up Practice 9.3 of MCCG 2017 is the establishment of a standalone Risk Management Committee (RMC) which comprises a majority of an independent director to oversee the firm's risk management framework and policies. An independent director on board minimises agency problems (Fuzi, Halim, & Julizaerma, 2016).

With the evolving nature of risk associated with the sophisticated business environment, uncertainty in the industry, and global market phenomenon, the urgency for a specialized RMC is necessary to ensure risk identification and mitigation are adequately supervised (Securities Commission, 2017). Since the traditional ways of combining two primary key areas (audit and risk management) into one board raise the board's effectiveness in undertaking their responsibilities in an impactful manner. Moreover, the time commitment is also at a cost due to overwhelmed obligations (Aldhamari et al., 2020).

Previous studies reported the advantages of having a standalone RMC separated from the Audit Committee (AC). By focusing on how standalone RMC could contribute towards better financial performance (Aldhamari et al., 2020; Halim, Mustika, Sari, Anugerah, & Mohd-Sanusi, 2017; Jia & Bradbury, 2020; Rimin et al., 2021), higher audit quality (Larasati et al., 2019) and shorter audit report lag (Omer, Aljaaidi, & Al-Moataz, 2020). Standalone RMC is also proven to promote voluntary disclosure (Abdullah et al., 2017) and reduce financial fraud incidences (Abdullah & Said, 2019) within the entity. However, limited studies explore the characteristics of RMC itself that define its effectiveness (Jia & Bradbury, 2020) to bring better firm performance. Perhaps, because the practice of having a standalone RMC is still not mandated in many countries and at the same time, the governance guide on RMC is still silent.

Realizing the benefits brought by the existence of standalone RMC, this study wishes to investigate further the current practices by the top 50 Malaysian listed firms in Bursa Malaysia subsequently after the release of the MCCG 2017 to see the adoption of the best practice recommended by SC regarding the establishment of standalone RMC. It would be interesting to see how the large, listed firms react towards the encouragement made by SC subsequently after the guide is released on 26 April 2017. Further consideration would be given to the characteristics of RMC in ensuring strong corporate governance presents within the listed firm's board structure. The attributes of RMC may include the board independence, board size and whether RMC established is independent of the AC. All the governance structure of the main board should also be embedded in the RMC structure to avoid eye obscuring RMC established

for the sake of complying with the best practice without properly undertaking their ultimate role seriously.

2. LITERATURE REVIEW

2.1 Agency Theory

The board of directors are the representative of shareholders has always rested within the agency theory concept. According to agency theory, board members appointed by the shareholder act as the agents who run the firm for the shareholder's best interest, known as the principal. A strong governance mechanism can monitor an agent's behaviour in maximizing the principal's return as the capital contributor (Rimin et al., 2021). One of the ways is by placing an internal supervision mechanism within the business operation (Halim et al., 2017), and RMC is one of the tools (Larasati et al., 2019; Nasution, 2019). RMC play a crucial role in resolving conflict of interest between shareholders and the board, subsequently increasing shareholder value. At the same time, it reduces information asymmetry due to the establishment of an independent board that causes higher integrity and promotes transparency in financial reporting (Aldhamari et al., 2020). Separate RMC will monitor various inherent risks with more focused risk oversight functions (Abdullah et al., 2017). A stronger governance mechanism exists with standalone RMC in place. It will increase the board's effectiveness in dealing with risk management issues and align the principal and agent interest, thus reducing agency problems.

2.2 Evolution of Risk Management Guide in Malaysian Code of Corporate Governance

The importance of risk management and an effective internal control framework was first introduced in MCCG 2000. However, limited guidance was given on how the board should execute this responsibility. It is up to the board to design its structure (Ishak & Mohamad Nor, 2017). How a board of directors perceive risk management responsibilities should reflect how they organize their board structure (Tonello, 2012). Later, when the MCCG was revised in 2007, it required listed firms to form an internal audit committee that includes a risk management team in charge of managing risk effectively and ensuring internal control procedures are in place (Ghazali & Manab, 2013; Rimin et al., 2021).

The third version of MCCG, released in 2012, has provided a detailed governance principle and recommendation for the best practice related to risk management. At this point, it is recommended for the board to establish a sound risk management framework and internal control system, but it is still optional requiring the listed firm to disclose their option in the annual report (Abdullah & Said, 2019; Ishak & Mohamad Nor, 2017). In 2017, to enhance corporate governance even further, the SC has come up with Step Up 9.3 of MCCG 2017. It encourages the non-financial listed firm to incorporate a standalone RMC on its own, which comprises an independent director who focuses solely on overseeing risk management procedures, thus enhancing the quality of risk assessment and monitoring landscape. Table 1 summarizes the Evolution of Risk Management Guide in Malaysia.

Currently, the establishment of standalone RMC in Malaysia is compulsory for financial institutions. It is due to their business model that mainly deals with the high volatility caused by greater market risk, high credit risk and liquidity risk resulting from the changes in the global economic environment (Bursa Malaysia, 2017). This requirement was mandated in Standard 12.1(c) of Bank Negara Malaysia's Policy Document on Corporate Governance. However, a separate RMC was not required for non-financial institutions. But with increasingly

sophisticated changes in the corporate landscape caused by technology advancement, political intervention, changes in business model and global uncertainty, it is no longer the case. Large, listed firms, including non-financial firms, need a focused oversight risk board equipped with extensive skills to play an active role in minimizing all-rounded risk to guarantee business going concerned (Abdullah et al., 2017).

Table 1. Evolution of Risk Management Guide in Malaysia

MCCG 2000	MCCG 2007	MCCG 2012	MCCG 2017
The introduction of the Risk Management Concept place under the board of director's responsibility. It is to identify risk and mitigate the risk through an effective internal control framework.	Listed firms must form a structured internal audit committee that includes a risk management team in performing its risk management function. The Securities Commission defined three major areas of responsibilities by internal audit function, including evaluating risk management effectiveness, internal control system and firm's governance structure.	A more detailed guide was issued under eight broad principles. Risk management was highlighted under the Sixth Principle, whereby listed firms are encouraged to establish a sound risk management framework and internal control system. But adherence to this recommendation is still voluntary.	In moving towards enhancing governance structure, large, listed firms are encouraged to establish standalone RMC comprises independent directors that focus solely on overseeing risk management strategies.

Source: Series of Malaysian Code of Corporate Governance by Securities Commission

2.3 Combined Committee: Traditional Board Structure

Previously, the risk management function was not thought to be very important by the board in Malaysia (Aldhamari et al., 2020; Omer et al., 2020). Therefore, the risk management role was included within the AC's responsibilities, and most of the firms named this combined committee as Audit and Risk Management Committee. This traditional practice caused a great impact on the board's effectiveness in executing their responsibilities. Since the AC function itself is already overwhelmed with its role to oversee financial reporting process, supervise audit process, evaluate internal control procedures, review the financial report and dealing with external auditors for timely issuance of the audited financial report (Boudiab & Ishak, 2020; Abdullah & Said, 2019). This extensive job scope raises concern on how the AC executes its risk management duties carefully and adequately (Abdullah et al., 2017; Nasution, 2019).

This fact was also supported by a review made by Bursa Malaysia (2017), whereby AC was reported to be the most time-consuming committee, which held on average seven meetings in 2016 compared to other committees with four meetings held annually (Bursa Malaysia, 2017). Additionally, the requirement for an AC member to keep up to date with the recent development of accounting standards demand additional time and further commitment. As a result, the overburdened AC tends to overlook risk issues despite the fatal consequences that might happen in the absence of a comprehensive risk management team (Aldhamari et al., 2020; Halim et al., 2017). Hence, large firms should segregate the risk manager's role in today's sophisticated risk environment to ensure better delivery of board function in fulfilling their risk management responsibilities to avoid agency problems (Abdullah et al., 2017; Aldhamari et al., 2020).

2.4 Effectiveness of Standalone Risk Management Committee

Literature has provided empirical evidence on the effectiveness of RMC, mainly on firm financial performance in developing countries. One of the studies was conducted by Halim et

al. (2017). He discovered firms with a standalone RMC are more effective in managing their financial risks thus have better financial performance. Having a separate RMC distinct from the AC allows the directors to focus and specialize on risk management efforts enabling them to dedicate more time and commitment for better risk monitoring to minimize firms' losses. Another study by Aldhamari et al. (2020) investigates the impact of RMC on financial performance among financial firms in Malaysia. They discovered financial performance is better for firms with effective RMC by enhancing transparency and integrity of financial reporting having a dedicated risk oversight team on board. In 2021, Rimin et al. conducted a study on consumer goods sector listed firms in Malaysia. They reported a positive relationship between separate RMC and financial performance measured by Tobin Q, implying firms with standalone RMC have better market valuation due to the risk monitoring mechanism.

The Risk Management Committee was also reported to bring benefits to non-financial aspects. Abdullah and Said (2019) uncovered a significant inverse relationship between standalone RMC and financial fraud incidences among Malaysian listed firms from 2001 to 2013. The existence of RMC separated from AC proved to be an effective tool in combating financial fraud by having an independent risk monitoring board whose responsibility is to mitigate risk within the business environment. In Indonesia, Larasati et al. (2019) drew samples from Indonesian listed firms that revealed that firms with separate RMC require higher audit coverage, thus affecting higher audit fees. Hence, positively improve audit quality. The result from prior studies on Malaysian non-financial firms demonstrated that the establishment of RMC could encourage better voluntary risk management disclosure in the financial report (Abdullah et al., 2017). With the information possessed by RMC through an effective monitoring role, firms are willingly disclosing their positive risk management information for better transparency.

2.5 Risk Management Committee Attributes

Given an extensive study on the effectiveness of RMC on financial and non-financial performance, studies on RMC attribute itself is limited due to RMC establishment remains voluntary in most countries, including Malaysia, Indonesia and Australia. Most of the existing studies focus on the main attributes, including committee size (Abubakar et al., 2018; Boudiab & Ishak, 2020), independence of members (Aldhamari et al., 2020; Jia & Bradbury, 2020; Ugwu, Ekwochi, & Ogbu, 2021), members knowledge and qualification (Aldhamari et al., 2020; Jia & Bradbury, 2020), number of meeting (Alkelani, Hussin, & Salim, 2020) and number of training attended by the members (Boudiab & Ishak, 2020). However, none of them had investigated if the RMC is independent of the AC after considering the work overload that AC members already have in hand.

3. METHOD

3.1 Research Design and Sample Selection

This study used a quantitative approach and descriptive research design to see the adoption level on the establishment of standalone RMC among the top 50 Malaysian largest listed firms. Then, attributes of RMC are analysed further to describe the governance structure of the established RMC. The population of this study is the listed firms in Bursa Malaysia, covering all sectors but excluding financial institutions. The sample selection of the top 50 largest firms by market capitalization according to the list provided by FBM KLCI is justified because larger firms are associated with high risk (Halim et al., 2017). Thus, it has more reasons to establish a separate RMC (Nasution, 2019), for instance, due to the high complexity of their economic

environment and higher leverage. Therefore, the recommendation made by the SC is, particularly for large, listed firms. Perhaps this purposive sampling method will help draw a better insight into the adoption level of the best practice to establish a standalone RMC among the top 50 Malaysian listed firms. The sample size of 50 companies is then multiplied with two consecutive years (2018 and 2019) to make up 100 observations. Both years were selected as the latest year after the issuance of the MCCG 2017.

3.2 Data Collection and Data Analysis

The data in this current study was collected from annual reports taken from Bursa Malaysia's official website and sampled firm's websites. They are considered secondary data. Content analysis was performed to gather information about the characteristics of each firm's board of directors on the establishment of standalone RMC apart from the AC and its attributes. Table 2 shows the definition of the variables selected in this study.

Table 2. Variables Definition

Variables	Definition
Combined committee	Combination of audit and risk management function in a single committee
Standalone RMC	Board established a separate RMC apart from AC
Size of RMC	Number of members on RMC
Independence of RMC members	The proportion of independent directors on RMC to total RMC members
Dual chairmanship	The chairman of RMC also chairs AC
Mutual membership	If the chairman of RMC does not chair AC, at least 1 mutual member is also in AC
Independent RMC from AC	RMC has its chairman with different members from AC

The data were obtained primarily from a few specific sections of the firms' annual reports, including firm Governance Framework, Corporate Governance Overview Statement, Board of Director Profile, Audit Committee Report, Risk Committee Report and Statement on Risk Management and Internal Control. Upon completion of data collection, the frequency and percentage were computed on all variables. The analysis was performed using Microsoft Excel 365 function in generating figures and tables to facilitate the presentation of data for discussion purposes.

4. RESULTS AND DISCUSSION

4.1 The Adoption Level of Risk Management Committee Establishment

Table 3. Adoption of Risk Management Committee Establishment

	2018 (*N*=50)		2019 (*N*=50)		Entire sample (*N*=100)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Combined committee	25	50	21	42	46	46
Standalone RMC	25	50	29	58	54	54
Total	50	100	50	100	100	100

Step-Up Practice 9.3 of MCCG 2017, encourages large, listed firms to establish a standalone RMC to improve the corporate governance culture of public listed firms by sharpening risk management strategy and focus. Table 3 demonstrates the adoption level of RMC establishment among the top 50 largest listed firms in 2018 and 2019.

Overall, the majority (54%) of the firms take a step further in enhancing the effectiveness of their risk management strategy by forming a standalone RMC. When the data is accessed separately by year, there is an increased number of firms with standalone RMC in 2019 (58%) compared to 2018 (50%). Indicating the level of adoption of this step-up practice is better in the second year after revision of MCCG for the fourth time in 2017. It was anticipated that firms need time to restructure their board for better management and coordination. Some of the firms also grouped the function of risk oversight with sustainability roles. They named it Sustainability and Risk Management Committee, most probably because the board sees the linkages between these two crucial functions for firm continuity.

4.2 Attributes of Risk Management Committee

This study further analyses the attributes of RMC established by reference to prior literature on good corporate governance structure. In general, the average number of members on RMC is 4, whereby 4.20 in 2018 and 4.03 in 2019 and the majority are independent. There is no specific number of RMC members required by the SC or Bursa Malaysia to date, but the ideal minimum size would be three as practised by the busiest committee, the AC. Moreover, the majority of members must be independent. Independent directors are seen as a mechanism of good corporate governance (Ishak & Mohamad Nor, 2017; Kweha et al., 2019). By being independent, the board that has no interest in the firms will act diligently to provide effective monitoring to the manager without the influence of any party (Fuzi et al., 2016; Karim, Manab, & Ismail, 2020). The exact requirement was also found under general board composition in Practice 4.1 of MCCG 2017.

Table 4. Attributes of Risk Management Committee

	2018 (N=25)		2019 (N=29)		Entire sample (N=54)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Independent RMC from AC	2	8	3	10	5	9
Dual chairmanship	6	24	8	28	14	26
Mutual membership	17	68	18	62	35	65
Total	25	100	29	100	54	100

The expectation is that when a firm establishes a standalone RMC, it should employ distinct members to serve the committee. However, the finding tells a different story. Based on Table 4, observation on whether RMC is independent, the AC uncovered only 5 out of 54 firms with standalone RMC has a risk committee that has nothing to do with the AC. It represents only nine percent out of the total observation for the two years. It shows that even though the majority of sampled firms adapted the best practice to have a standalone RMC on board, they decided to utilize the same talent to take advantage of the synergies provided by having the similar person on different board committee regardless of the issue of the overburdened committee and poor execution of their responsibilities (Abdullah et al., 2017; Aldhamari et al., 2020). There was not much difference in whether the firms have a combined committee that has been practising in the traditional board structure or opt for a standalone RMC following the recommended best practice. The fact was supported by further finding that 26% of firms with standalone RMC have a chairman who also chairs the AC. But the most normal practice among these largest listed firms is that although the chairman of RMC does not chair the AC, at least one mutual member exists in both the RMC and AC who carries out these dual functions, which amount to 65%.

Corporate Governance Guide by Bursa Malaysia, there is no harm for the chairman of the AC to chair another board committee, including the RMC, as the risks are insignificant (Bursa Malaysia, 2017). However, prior literature had argued that overwhelmed job scope of AC members should be given a severe thought of organizing the board structure. To ensure the quality of work performed can be maintained at a high level and prevent inadequate attention on risk management issues (Abdullah & Said, 2019; Aldhamari et al., 2020; Omer et al., 2020). This issue is prone for large, listed firms expected to deal with the greater risk profile and complex business model (Tonello, 2012). Having the same members on these two separate committees will impair the efficiency and effectiveness of audit and risk management mechanisms caused by disability to devote sufficient time and attention to a specific affair.

However, as the board of directors can organize its structure, they should know their operation and business model better in maximizing shareholder's interest. The board should critically consider several factors in deciding its operational oversight function to ensure risk issues are satisfactorily tackled and appropriately mitigated. The board should recognize the risk coupled with the business model, product and market in entirety to enable them to come out with the appropriate risk management mechanism (Ishak & Mohamad Nor, 2017). Having either a combined or standalone RMC requires proper synchronization with the other subcommittee in building up an all-rounded risk-ready culture to protect the stakeholder interest. The board of directors has the final say about this yet; careful consideration is a must since it has a fatal effect on the firm survivability.

5. CONCLUSION

The RMC establishment as a standing committee is some strength of the firm that will aid in a proactive risk management system and consequently create a risk awareness culture within the organization. Having a focused committee responsible for risk identification and mitigating issues would encourage an all-rounded risk management effort that would lead to business sustainability and growing concern. Findings from the current study revealed encouraging results that most large, listed firms in Malaysia have adopted this best practice by forming a standalone RMC following the Step-Up Practice 9.3 of MCCG 2017. However, small essential details about the attributes of this governance mechanism should be given serious consideration to avoid public confusion and eye obscuring committee that stand on its name without its real substance. For instance, the study found Malaysian listed firms with standalone RMC are heavily tied to the AC in terms of their mutual member on board and the same director chairs both committees. Utilizing the synergies behind this "separated but combined" board structure, overwhelmed duties of AC members should not be ignored. The board of directors should carefully organize and coordinate the committee's structure on board, especially on RMC establishment, with caution thought by analysing the pros and cons of each available option to avoid sudden corporate failure that highly relies on risk management mechanisms.

This descriptive study has contributed to the body of literature by providing insights into the governance structure of Malaysian listed firms' RMC from its operationalization aspect and its detailed characteristics after the issuance of MCCG 2017. It creates awareness among listed firms on the importance of a focused, standalone RMC in an effective risk management strategy. Moreover, it provides ideas on possible future research that could be conducted. Future research should consider investigating a significant difference in firms' performance if firms establish a standalone RMC or stick to a combined committee. However, this study comes with several limitations. Due to time constraints, small sample size was used with a short observation period of two years. The focus of this study is on the separation of the AC and RMC. Thus, other essential attributes of RMC are ignored, for example, members' knowledge

and qualification and the number of meetings held per year. Therefore, future research should incorporate these limitations in deriving a better result representation.

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Exploring Two Methods of Partial Fraction Decomposition on Students' Performance

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ABSTRACT

Different partial fraction decomposition (PFD) methods may drive students to explore and understand partial fractions and thus, improve their mastery in PFD performance. Hence, this study explored the effectiveness of using two different methods, namely the improved version of the Heaviside method and the undetermined coefficients method, in performing PFD of the proper partial fraction. Literature showed that most of the instructors employed the undetermined coefficients method, and little is known about the effectiveness of employing other methods on students' performance. This study used a quasi-experimental approach with a pre-test and post-test interval. Purposive sampling was employed as all the participants are from science stream, have completed Calculus I course, and learnt PFD. A total of 148 undergraduates from two faculties of a Malaysian public university were purposefully chosen for this study. The pre-test and post-test scores of PFD for three categories of factors in the denominator using the two methods were collected. Then, the statistical results of pre-test and post-test were examined using IBM SPSS 21. The mean scores of the tests were analysed using paired sample t-tests and analysis of covariance. The findings revealed that students who used the improved version of the Heaviside method outperformed those who used the undetermined coefficients method in performing the PFD of proper rational functions for distinct linear factor and irreducible quadratic factor in the denominators. However, the performance for both methods was insignificantly different for solving PFD of proper rational functions concerning repeated linear factor in the denominator. This study provides valuable insights into the choice of PFD methods employed by instructors in bringing out the best in students' performance.

1. INTRODUCTION

Partial fraction decomposition (PFD) is the process of decomposing a complex rational fraction into the sum of simple rational fractions. PFD is thus the reverse of the summation of simple rational fractions. In learning elementary integral calculus, PFD is the initial step of computation before integrating. It is usually easier to integrate simple rational fractions than to integrate complex rational functions. Performing the PFD computation effectively with high numerical accuracy is often the primary concern in PFD learning. Though numerous algorithms or approaches to decompose certain types of rational functions into partial fractions are available, not all of them are suitable for manual calculation. Fundamental knowledge of certain methods used to complete PFD computation is also needed. For instance, the PFD coefficient can be found by using Taylor polynomial computation (Kwang & Xin, 2018) but to the knowledge of the researchers in this study, students must be well-versed in the divide-and-conquer method to perform this computation effectively. In addition, the PFD coefficient can also be found by employing repeated synthetic division (Kim & Lee, 2016). However, to our knowledge and based on our observations, students need to apply repeated synthetic division. Furthermore, the PFD coefficient can be found using the differentiation method (Özyapici & Pintea, 2012) but students must have a strong basic knowledge of differentiation to conduct the computation. Although Wang (2007) proposed a set of PFD formulas that can be used for immediate integration, students must have superior memorization reasoning to memorize the formulae needed to perform the computation.

The theoretical and empirical literature review shows that students are often introduced to use the undetermined PFD method in solving PFD coefficients at schools and even higher learning institutions. (e.g., William, 2018; Manoj, Ashvini, & Hole, 2020; Kwang & Xin, 2018). The undetermined coefficients PFD method largely emphasizes the use of the algebra approach for solving PFD coefficients. However, students who are not proficient in applying basic algebraic concepts for solving PFD coefficients will eventually end up with a poor performance in PFD. Furthermore, it has an impact on integrating proper rational fractions when students make mistakes or use incorrect PFD coefficients. Hence, students tend to lose marks in this whole process of performing PFD and integrating proper rational fractions which will ultimately affect their overall performance.

The concerns and awareness of the limitations discussed above, specifically in employing undetermined coefficients PFD method to solve PFD coefficients have prompted the researchers of this study to look for other PFD methods that can lead to optimal student performance. Therefore, a complete computation of the improved Heaviside PFD method introduced by Man (2012) was explored in this study. This method uses the formulation of simple polynomial division and the substitution concept to obtain PFD coefficients. The fewer steps required in this method help reduce students' errors in computation and prompt them to obtain accurate solutions as compared to using the undetermined coefficients PFD method. To obtain insights into the two PFD methods chosen for this study, we explore the effectiveness of these two PFD methods on students' PFD performance of the proper rational function.

2. LITERATURE REVIEW

Several computation methods of decomposing a rational function into partial fraction have been broadly employed in the application of calculus, differential equations, control theory and some areas of pure or applied mathematics (Kwang & Xin, 2018; Manoj et al., 2020; Kim & Lee,

2016; Ma et al., 2014; Bradley & Cook, 2012; Man, 2012; Özyapici & Pintea, 2012). However, it is observed that two PFD coefficients computation methods that are more commonly used, namely the undetermined coefficients method and the cover-up method. (e.g., William, 2018; Kim & Lee, 2016; Ma et al., 2014; Man, 2012). According to Linner (1974, cited in Ma et al., 2014), the well-known cover-up method always serves as a basis for other PFD methods and provides a compact solution to PFD problems. This, however, has a limitation when it comes to the evaluation of high-order poles in high-order polynomials as it could result in huge numerical errors when the successive differentials procedures increase (Ma et al., 2014; Kwang & Xin, 2018). Another standard PFD method, namely the undetermined coefficients method, requires the construction of a system of equations by matching up the variables after removing the fractions form from the combination of partial fractions and a proper rational function using the least common denominator procedure and resolving of the resultant system of equations to obtain PFD coefficients. It can be a very lengthy, complicated, and inconvenient computation when decomposing more than two partial fractions (Wang, 2007; Gupta, 2011, Man, 2012). Therefore, there is a higher possibility for students to make more arithmetic mistakes in this whole process of computation.

The extant literature shows that many students have difficulties solving questions that are associated with the concepts of fractions and algebraic expressions. Titus' (2010) study reported 35% to 42% of the college students enrolled in development mathematics course committed error patterns in the real number computations because most of the students have an unclear understanding of signed number arithmetic, fractions, distributive property, as well as exponential errors. Moreover, Brown and Quinn's research (2006) discovered that more than half of the 143 ninth graders who enrolled in an elementary algebra course at an upper-middle-class school showed a lack of experience and had low proficiency in both fraction concepts and computations. In addition, Bentley and Bossé's (2018) study supported Gabriel et al.'s (2013) finding that college students committed mistakes in wrongly applying fraction operations, as seen in elementary students' misunderstandings and misconceptions. Hanson and Hogan (2000) who examined the computational estimation skills of 77 college students majoring in a variety of disciplines discovered that many students struggled with the process of obtaining common denominators. They also highlighted that few students in the lower performing groups, added or subtracted the numerators and denominators but failed to find common denominators. Furthermore, Steen (2007) emphasized that even adults were found confused if a problem requires anything in the simplest of fractions. Considering the above findings, students' difficulties with fraction concepts are found to be partly responsible for failure in finding PFD coefficients using undetermined coefficients method computation. Hence, many instructors seek alternative methods that could increase the accessibility of the PFD method for students who are weak in concepts of fractions.

Another error pattern, namely difficulties with algebraic equations and arithmetical computation in schools has also been well-documented. The difficulties are related to the inability to see the algebraic structures of the tasks, inadequate conceptual knowledge of the problem, a lack of manipulative expression skills, calculation mistakes, and technical errors (Taban & Cadorna, 2018). In addition, algebra's structure sense is said to be a part of students' difficulties. The difficulties in structure sense include using arithmetical operations in numerical and algebraic expressions, understanding the notion of variables, algebraic expressions, as well as determining the meanings of the equal sign and mathematization (Jupri et al., 2014; Hoch & Dreyfus, 2010). It is also reported that students with high-performance mathematics in secondary schools also had difficulty with algebraic manipulation. They

struggled to formulate equations by manipulating correct algebraic expressions; they had weak arithmetic skills; and they made arithmetic errors which caused them to make algebraic errors (Novotna & Hoch, 2008). Another finding shows that students find it difficult to apply previously learnt algebraic techniques (Matzin & Shahrill, 2015). The in-depth analysis on school-aged students' errors in algebra problem solving conducted by Booth and colleagues (2014) reveals six common errors made: variable errors, negative sign errors, equality or inequality errors, operation errors, mathematical properties errors, and fraction errors. Moreover, Ashlock (2010) in his analysis of error patterns made by students discovered that, school-aged students often have misconceptions and make procedural errors in both mathematical operations and methods of computations. These error analyses highlight the most crucial computational mistakes committed by students prior to obtaining the final PFD coefficients when undetermined coefficients method computation was being carried out.

Concerning the above discussions, many PFD methods were proposed to complement the undetermined coefficients methods commonly and widely employed by instructors. Some of the methods are found to perform better than undetermined coefficients methods under specific conditions. For example, some methods are more suitable for small-scale problems, but they may become complicated when used for large-scale problems. In Man's (2007) research, he proposed a Heaviside's cover-up method, which requires simple substitutions to find partial fraction coefficient with single poles and apply successive differentiation for multiple poles. Man (2012) subsequently proposed an improved version of Heaviside's approach to compute partial fraction coefficients by using simple substitutions and polynomial divisions. This method does not require solving the complex roots of the quadratic polynomial, differentiation, or the solution of a system of linear equations for the PFD of a proper rational function. Its simplicity and applicability in applied and engineering mathematics as recommended by several researchers (e.g., William, 2018; Manoj et al., 2020; Man, 2012) to employ this improved method in teaching integrals of proper rational functions have compelled the researchers of this current study to explore the potential application of this method on teaching undergraduate students as an alternative method to the undetermined coefficients method in finding the PFD coefficients.

To further examine students' understanding in applying partial fraction decomposition method, the effectiveness of applying the improved version of the Heaviside PFD method and the undetermined coefficients PFD method on their PFD performance is explored. Thus, the research question of this study is: Which application of PFD method (the improved version of Heaviside PFD method or the undetermined coefficients PFD method) improve students' performance? The following Null Hypotheses were developed to answer the research question:

1. The improved version of Heaviside method has no effect on students' PFD performance.

2. The undetermined coefficients method has no effect on students' PFD performance.

3. There is no significant difference between students' PFD performance taught with improved version of the Heaviside method and those taught with undetermined coefficients method.

2.1 Partial Fraction Decomposition

A brief description of a partial fraction decomposition is presented in the next page:

Assume that G is a constant field comprises two polynomials, $W(x)$ and $S(x)$. A proper rational function is $G(x) = \dfrac{W(x)}{S(x)}$, where the degree of $W(x)$ is lower than the degree of $S(x)$ and

$$S(x) = \prod_{i=1,l=1}^{i=m,l=n} (x-a_i)^{j_i} (x^2 + b_l x + c_l)^{k_l},\ a_i, b_l, c_l \text{ are constants with } b_l^2 - 4c_l < 0,\ S(x) \text{ never be}$$

0 and belongs to G, and i, j, k, l, n, m are positive integers.

A partial fraction decomposition of $G(x)$ is:

$$G(x) = \sum_{i=1}^{m} \sum_{t=1}^{j_i} \frac{A_{it}}{(x-a_i)^t} + \sum_{l=1}^{n} \sum_{t=1}^{k_l} \frac{B_{lt} x + C_{lt}}{(x^2 + b_l x + c_l)^t},\ \text{ where } A_{it}, B_{lt}, C_{lt} \text{ are coefficients constants}$$

with t representing positive integers.

Two methods of PFD were used in this study to compute the unknown coefficients A_{it}, B_{lt}, C_{lt} and followed the procedure as shown below:

2.1.1 The Improved Version of Heaviside Method

For distinct and repeated linear polynomial denominator, assume that B_{lt} and C_{lt} are zeros, and multiplying the equation of G(x) with $(x-a_i)^t$, and replacing x with a_i to get coefficient $-i,t$ of A, polynomial division, $A_{it} = \dfrac{W(x)}{S(x)}(x-a_i)^t \big|_{x=a_i}$ is obtained. In order to obtain the next coefficient $-i,t\text{-}j_i$ of A in the polynomial division, the known partial fractions are subtracting from F(x), $A_{i(t-j_i)} = \left(\dfrac{W(x)}{S(x)} - \displaystyle\sum_{k=0}^{j_i-1} \dfrac{A_{i,j_i-k}}{(x-a_i)^{j_i-k}} \right)(x-a_i)^{t-j_i} \big|_{x=a_i}$ or using the straightforward process, $A_{i(t-j_i)} = \dfrac{W_{j_i}(x)}{S_{j_i}(x)}(x-a_i)^{t-j_i} \big|_{x=a_i}$. This process would be progressing until all the unknown coefficients A_{it} are found.

For irreducible quadratic polynomial denominator, assume that A_{it} is zero and multiplying the equation of G(x) with $(x^2 + b_l x + c_l)^t$ and modifying the numerator and denominator for the purpose of replacing x^2 with $b_l x + c_l$ to obtain coefficient $-i,t$ of B and C in polynomial division, $B_{it} x + C_{it} = \dfrac{W(x)}{S(x)}(x^2 + b_l x + c_l)^t \Big|_{x^2 = -b_l x - c_l}$. Repeat the same process that described above to

find all the unknown coefficients, B_{lt} and C_{lt} by the polynomial division formula,

$$B_{i(t-k_l)} \, x + C_{i(t-k_l)} = \left(\frac{W(x)}{S(x)} - \sum_{k=0}^{k_l-1} \frac{B_{i,j_i-k} \, x + C_{i,k_l-k}}{\left(x^2 + b_l \, x + c_l\right)^{k_l-k}} \right) \left(x^2 + b_l \, x + c_l\right)^t \Bigg|_{x^2 = -b_l \, x - c_l} .$$

2.1.2 The Undetermined Coefficients Method

By multiplying the equation of G(x) with the common denominator to obtain a polynomial equation with coefficients which are linear expressions of the constants A, B, and C. The coefficients of the same terms are equalized to form a system of linear equations since both sides of polynomials are equal only on condition that their corresponding coefficients are equal. The system of linear equations is then solved to find all unknown coefficients $A_{11,...,} A_{it}, B_{11,...,} B_{lt}, C_{11,......,} C_{lt}$.

The three questions below were used in this study to describe the ways to obtain answers to the questions using two methods:

2.1.2.1 Question 1

Find the partial fraction expansion of the proper rational function for distinct linear polynomial denominator, $G(x) = \dfrac{1-2x}{6x^2 + x - 1}$.

Solution:

The PFD expressed as $\dfrac{A_1}{3x-1} + \dfrac{A_2}{2x+1}$ where A_1 and A_2 are unknown coefficients to be determined.

A. The Improved Version of Heaviside Method
Using polynomial division formula, the following steps are performed:

$$A_1 \big|_{x=\frac{1}{3}} = \frac{(1-2x)(3x-1)}{(2x+1)(3x-1)} = \frac{1-2\left(\frac{1}{3}\right)}{2\left(\frac{1}{3}\right)+1} = \frac{1}{5}$$

$$A_2 \big|_{x=\frac{-1}{2}} = \frac{(1-2x)(2x+1)}{(3x-1)(2x+1)} = \frac{1-2\left(\frac{-1}{2}\right)}{3\left(\frac{-1}{2}\right)-1} = \frac{-4}{5}$$

B. The Undetermined Coefficients Method
Multiplying G(x) with the common denominator as follows:

$$\frac{(1-2x)(2x+1)(3x-1)}{(2x+1)(3x-1)} = \frac{A_1}{(3x-1)}(2x+1)(3x-1) + \frac{A_2}{(2x+1)}(2x+1)(3x-1)$$

To obtain polynomial equation,
$$1-2x=(2x+1)A_1+(3x-1)A_2$$

Hence, the coefficients of the same terms to form a system of linear equations is equalized.

constant, $1=A_1-A_2$

x term, $-2=(2)A_1+(3)A_2$

Lastly, the above system of linear equations to find A_1 and A_2, are solved.

Thus, partial fraction of $F(x)=\dfrac{1}{5(3x-1)}-\dfrac{4}{5(2x+1)}$.

2.1.2.2 Question 2

Find the partial fraction expansion of the proper rational function for repeated linear polynomial denominator, $G(x)=\dfrac{3+4x}{(x)(x+5)^2}$.

Solution:

The PFD expressed as $\dfrac{A_1}{x}+\dfrac{A_2}{x+5}+\dfrac{A_3}{(x+5)^2}$ where A_1, A_2 and A_3 are unknown coefficients to be determined.

A. The Improved Version of Heaviside Method
Using polynomial division formula to find A_1, A_2 and A_3, the following steps are performed:

$$A_1\big|_{x=0}=\dfrac{(3+4x)(x)}{(x)(x+5)^2}=\dfrac{(3+4(0))}{(0+5)^2}=\dfrac{3}{25}$$

$$A_3\big|_{x=-5}=\dfrac{(3+4x)(x+5)^2}{(x)(x+5)^2}=\dfrac{(3+4x)}{(x)}=\dfrac{(3+4(-5))}{(-5)}=\dfrac{17}{5}$$

Thus, the value of a and c are substituted into $G(x)$, the following steps are performed:

$$\dfrac{(3+4x)}{(x)(x+5)^2}=\dfrac{3}{25x}+\dfrac{A_2}{x+5}+\dfrac{17}{5(x+5)^2}$$

To solve b, x is replaced with one,

$$\frac{(3+4(1))}{(1)(1+5)^2} = \frac{3}{25} + \frac{A_2}{1+5} + \frac{17}{5(1+5)^2}$$

$$A_2 = \frac{-3}{25}$$

B. The Undetermined Coefficients Method
Multiplying G(x) with the common denominator as follows:

$$\frac{(3+4x)(x)(x+5)^2}{(x)(x+5)^2} = \frac{A_1}{(x)}(x)(x+5)^2 + \frac{A_2}{(x+5)}(x)(x+5)^2 + \frac{A_3}{(x+5)^2}(x)(x+5)^2$$

To obtain polynomial equation:

$$(3+4x) = A_1(x+5)^2 + A_2(x)(x+5) + A_3(x)$$

The coefficients of the same terms to form a system of linear equations are then equalized.
constant, $3 = 25A_1$

x term, $4 = (10)A_1 + (5)A_2 + A_3$

x^2 term, $0 = (1)A_1 + (1)A_2$

Lastly, the system of linear equations to find A_1, A_2 and A_3 are solved.

Thus, partial fraction of $F(x) = \dfrac{3}{25x} - \dfrac{3}{25(x+5)} + \dfrac{17}{5(x+5)^2}$.

2.1.2.3 Question 3

Find the partial fraction expansion of the proper rational function for irreducible quadratic polynomial denominator, $G(x) = \dfrac{2-5x}{(x)(x^2+16)}$.

Solution:

The PFD expressed as $\dfrac{A_1}{x} + \dfrac{A_2x+A_3}{x^2+16}$ where A_1, A_2 and A_3 are unknown coefficients to be determined.

A. The Improved Version of Heaviside Method
Using polynomial division formula to find A_1, and by adding x to the polynomial division formula to find A_2 and A_3 as follows:

$$A_1 \big|_{x=0} = \frac{(2-5x)(x)}{(x)(x^2+16)} = \frac{(2-5(0))}{(0^2+16)} = \frac{2}{16}$$

$$A_2x + A_3 \big|_{x^2=-16} = \frac{(2-5x)(x^2+16)}{(x)(x^2+16)} = \frac{(2-5x)(x)}{(x)(x)} = \frac{(2x+16(5))}{(-16)} = \frac{-2x}{16} - \frac{80}{16}$$

B. The Undetermined Coefficients Method

Multiplying G(x) with the common denominator as follows:

$$\frac{(2-5x)(x)(x^2+16)}{(x)(x^2+16)} = \frac{A_1}{(x)}(x)(x^2+16) + \frac{A_2x+A_3}{(x^2+16)}(x)(x^2+16)$$

To obtain polynomial equation:

$$(2-5x) = (x^2+16)A_1 + (x)(A_2x+A_3)$$

The coefficients of the same terms to form a system of linear equations are equalized.

constant, $2 = 16A_1$

x term, $-5 = A_3$

x^2 term, $0 = (1)A_1 + (1)A_2$

Lastly, the system of linear equations to find A_1, A_2 and A_3 are solved.

Thus, partial fraction of $F(x) = \dfrac{2}{16x} + \dfrac{-2x-80}{16(x^2+16)}$.

3. METHODOLOGY

3.1 Participants

In this study, purposive sampling was employed. The participants in this study were all purposefully chosen since they all had a similar foundation in science, had completed Calculus I in the previous semester, and were taught PFD as part of their course. This type of sampling will yield useful information about the expected outcome of the study. The participants of this study comprised 148 undergraduate students from the Faculty of Civil Engineering and the Faculty of Applied Sciences in the Universiti Teknologi MARA Sarawak Branch. From the total of 148 students in this study, 72 were enrolled in Calculus II for Engineers course during semester two while 66 in the Foundation of Applied Mathematics course at semester three. This study was conducted during the academic year 2020-2021.

3.2 Instrumentation

For this study, an experimental design was adopted, and pre-test and post-test were administered. These tests were conducted to evaluate the students' performance in solving questions testing their knowledge on partial fraction decomposition using two different methods. The results obtained provide a better understanding of how well students perform

partial fraction decomposition using both the undetermined coefficients method and the improved version of Heaviside's cover-up method.

The pre and post-tests contained 3 questions. The questions were adopted from the university's Item Bank System (IBS). An item bank is a computerized collection of test items. The assessment specification table (JSU) was used to design test items, which complied with the Ministry of Education's requirements and university's guidelines. The JSU was developed to ensure test items were of high quality, valid, reliable, fair, and consistent. For efficient management procedure, Academic Affairs designated an experienced Resource Person (RP) to examine and approve test items and scoring rubrics that met JSU standards. (Raus et al., 2014; Vaibhav & Arvind, 2013; Syahidah & Nazlia, 2012). Minor adjustments were made based on the review feedback obtained from two experienced lecturers who are experts in this subject as well as guidelines elicited from the literature (Betsy, Kasturi, Chiang, & Goh, 2015). The questions were on proper rational function. The corresponding category of proper rational functions included distinct linear factors in the denominator, repeated linear factors in the denominator and irreducible quadratic factors in the denominator. The marks allocated to each question are ranged from 0 to 10, with 0 for incorrect answers and 10 for correct answers.

All the students were taught about two PFD methods by the same instructor. Students took a pre-test after completing the 6-hour instruction. Students were asked to use the undetermined coefficients method and the improved Heaviside's cover-up method to decompose the proper rational functions with different categories of denominators. The duration of the test is 60 minutes. The pre-test and post-test were administered one month apart to ensure that students have acquired and mastered the knowledge in applying the two different methods for solving partial fraction decomposition problems. Each question was marked using the modified scoring rubric for undetermined coefficients PFD method, which was adapted from IBS.

4. DATA ANALYSIS AND RESULTS

The statistical results of pre-test and post-test on solving PFD by employing the two methods were analysed using IBM SPSS 21 with respect to the three categories of factors in the denominator under study. The study omitted about 20% of the total results as some students were absent from either one of the tests administered. A total of 105 results for distinct linear factor and 106 results for irreducible quadratic factor and repeated linear factor were examined. The normality of difference means scores obtained between the pre-tests and post-tests using the two different methods were tested using the Kolmogorov–Smirnov(K-S) test, z test for kurtosis(K) and skewness (SK) coefficients at 0.05 level of significance. All results of the K-S test for means scores obtained were statistically significant.

However, in Table 1, z tests of means scores for K and SK was within ± 3 indicating that the distribution of means scores obtained were approximately normal (Orcan, 2020; Mishra et al., 2019; Kim, 2013). Besides, paired sample t-tests were conducted to evaluate the differences in students' performance in finding the partial fraction decomposition of proper rational function using the two methods at a 0.05 level of significance. In addition, an analysis of covariance (ANCOVA) was used to compare the efficacy of applying the improved Heaviside's cover-up method and undetermined coefficients method on finding PFD performance while controlling for the initial test at a 0.05 level of significance. For ANCOVA, the homogeneity of variations in the PFD performance was checked by performing Levene's test.

Table 1. Z Test of Mean Scores for Skewness and Kurtosis

| Partial fraction | Type of test | Heaviside's Cover-Up Method | | | Undetermined Coefficients Method | | |
| | | Skewness | | | Kurtosis | | |
		Value	Standard Error	z	Value	Standard Error	z
Distinct linear factor	Pre	-1.13	0.38	-2.97	-0.61	0.24	-2.59
	Post	0.03	0.47	0.06	-0.99	0.47	-2.13
Repeated linear factor	Pre	1.19	0.40	2.98	0.43	0.24	1.81
	Post	1.28	0.47	2.76	-0.98	0.47	-2.10
Irreducible quadratic factor	Pre	0.32	0.24	1.37	0.09	0.24	0.37
	Post	-0.61	0.47	-1.31	-0.56	0.47	-1.20

Table 2 shows PFD performance using the improved Heaviside's cover-up method. The mean pre-test scores for repeated linear factor, irreducible quadratic factor, and distinct linear factor were 2.49, 2.82, and 6.10, respectively while the mean post-test scores were 4.12, 6.84, and 8.59, respectively. The results of the means difference between the pre-test and post-test revealed a statistically significant improvement in finding the partial fraction decomposition of proper rational function for the three distinct factors in the denominators. Students showed better performance for irreducible quadratic factor compared to distinct linear factor and repeated linear factor. The effect sizes were 0.74, 0.66 and 1.32 for distinct linear factor [$t(104) = 8.35, p < .05$; 95% CI (1.9, 3.09)], repeated linear factor [$t(105) = 8.94, p < .05$; 95% CI (1.27, 1.99)],   and irreducible quadratic factor [$t(105) = 14.61, p < .05$; 95% CI (3.47, 4.56)], respectively. These effect sizes indicated moderate-to-large effects (Cohen, 1988; Kraft, 2020; Mathew, 2019; Nicolas, 2017). It reflects that a well-designed Heaviside's cover-up method will increase student's ability to find partial fraction decomposition of a proper rational function therefore improving their performance.

Table 2. Students' Performance in Pre-Test and Post-Test Using the Improved Heaviside's Cover-Up Method

Partial fraction	Type of test	M	SD	M difference	t	df	Sig. (2-tailed)
Distinct linear factor	Pre	6.10	3.71	2.50	8.35	104	.00
	Post	8.59	3.01				
Repeated linear factor	Pre	2.49	2.27	1.63	8.94	105	.00
	Post	4.12	2.66				
Irreducible quadratic factor	Pre	2.82	2.54	4.02	14.61	105	.00
	Post	6.84	3.49				

Table 3 indicates students' PFD performance using the undetermined coefficients method. Students had mean pre-test scores varied from 3.30 for repeated linear factor, 4.01 for irreducible quadratic factor, and 4.62 for distinct linear factor, whereas, for post-test scores, they ranged from 4.62 for repeated linear factor, 6.45 for distinct linear factor, and 6.48 for an irreducible quadratic factor. The findings showed a statistically significant increase in the mean test scores when solving the partial decomposition of rational functions with three distinct factors in the denominators. Students achieved the highest score for irreducible quadratic factor followed by distinct linear factor and repeated linear factor.

Table 3. Students' Performance in Pre-Test and Post-Test Using Undetermined Coefficients Method

Partial fraction	Type of test	M	SD	M difference	t	df	Sig. (2-tailed)
Distinct linear factor	Pre	4.62	2.89	1.83	10.40	104	.00
	Post	6.45	3.26				
Repeated linear factor	Pre	3.30	2.59	1.32	13.83	105	.00
	Post	4.62	2.75				
Irreducible quadratic factor	Pre	4.01	3.39	2.47	10.29	105	.00
	Post	6.48	3.56				

For distinct linear factor [t(104) = 10.40, $p < .05$; 95% CI (1.48, 2.18)], repeated linear factor [t(105) = 13.83, $p < .05$; 95% CI (1.13, 1.51)], and irreducible quadratic factor [t(105) = 10.29, $p < .05$; 95% CI (1.99, 2.94)], the effect sizes were 0.59, 0.40 and 0.71, respectively. The results of the effect size showed moderate-to-large effects (Cohen, 1988; Kraft, 2020; Mathew, 2019; Nicolas, 2017). In comparison to pre-tests, the findings revealed that using the undetermined coefficients method enhance students' performance in finding partial fraction decomposition in their post-test.

Table 4. Summary of the Analysis of Covariance of the Mean Post-Test Scores Using Different Methods

Sources of variance	df	Mean Square	F	Sig.
Distinct linear factor				
Pre-test	1	1001.076	197.653	.000
Methods	1	67.569	13.341	.000
Error	207	5.065		
Repeated linear factor				
Pre-test	1	1401.003	577.553	.000
Methods	1	0.827	0.341	.560
Error	209	2.426		
Irreducible quadratic factor				
Pre-test	1	1206.026	179.068	.000
Methods	1	87.744	13.028	.000
Error	209	6.735		

Table 4 displays the results of an ANCOVA comparison done between the mean post-test scores of the students' partial decomposition of proper rational functions using the improved version of Heaviside's cover-up method and those of the post-test scores obtained using the undetermined coefficients method with distinct linear factor, repeated linear factor, and irreducible quadratic factor, respectively. The analysis showed a significant difference between the performance in the partial decomposition of proper rational functions using the two methods with respect to distinct linear factor [$F(1, 207) = 13.34$, $p < 0.05$; eta-squared = 0.06; Levene's test: p-value = 0.17], and irreducible quadratic factor [$F(1, 209) = 13.03$, $p < 0.05$; eta-squared = 0.06; Levene's test: p-value = 0.09]. However, with respect to the findings for repeated linear factor, there was no significant difference between the performance in the partial decomposition of proper rational functions using the two methods [$F(1, 209) = 0.83$, $p > 0.05$; eta-squared = 0.00; Levene's test: p-value = 0.00]. The mean post-test scores obtained using the Heaviside's

cover-up method for distinct linear factor were 2.14 higher than the mean post-test scores obtained using the undetermined coefficients method. Similarly, for the irreducible quadratic factor, the mean post-test scores obtained by Heaviside's cover-up method were 0.36 higher than the mean post-test scores obtained by the undetermined coefficients method. Conversely, students who used Heaviside's cover-up method recorded 0.51 lower on the mean post-test scores of repeated linear factors than those students who used the undetermined coefficients method. Subsequently, the eta-squared statistics determines the difference in effect sizes between the two methods being compared whilst controlling for students' pre-test scores. The eta-squared (0.06) value showed a moderate effect size (Cohen, 1988; Kraft, 2020). This value indicated that the students who used Heaviside's cover-up method outperformed students who used the undetermined coefficients method in the partial fraction decomposition of proper rational functions concerning distinct linear factor and irreducible quadratic factor in the denominators. However, students displayed similar achievements in both methods for the partial fraction decomposition of proper rational functions with repeated linear factor in the denominator.

5. DISCUSSION AND CONCLUSION

This study aims to explore the effectiveness of applying the improved version of Heaviside's cover-up method and undetermined coefficients method in performing PFD, specifically of the proper rational functions. The main difference between applying the two methods is that students who use the undetermined coefficients method solve the system linear equations via algebra approach to find PFD coefficients, while students who use the improved version of the Heaviside's cover-up method evaluate PFD coefficients by performing substitution process in simple polynomial division functions. The results shown in Table 4 indicate that students who used the improved version of Heaviside's cover-up method outperformed those who used the undetermined coefficients method in the partial fraction decomposition of proper rational functions for distinct linear factor and irreducible quadratic factor in the denominators. However, the performance of using both methods is the insignificant difference for solving partial fraction decomposition of proper rational functions concerning repeated linear factors in the denominator. It may be ascribed to students' lack of mastery in applying the methods and their difficulties working with three partial fractions due to the lengthy, complicated, and inconvenient computations (Wang, 2007 cited in Jong & Kuan, 2020; Man, 2012). The finding of this study is consistent with the previous studies which postulated that students had a lack of proficiency in concepts of computing fractions (e.g., Bentley & Bossé, 2018; Gabriel et al., 2013; Titus, 2010; Steen, 2007) which resulted in low academic performance of the students (Bentley & Bossé, 2018; Kor et al., 2019; Jong & Kuan, 2020). In addition, some researchers purported that the major obstacles in students' failure to solve the system linear equations were weak in algebraic conceptual knowledge (Taban & Cadorna, 2018; Jupri et al., 2014; Hoch & Dreyfus, 2010; Jong & Kuan, 2020), inability to recognize the algebraic structures (Novotna & Hoch, 2008; Taban & Cadorna, 2018), and a lack of manipulating algebraic expressions skills (Booth el at., 2014; Ashlock, 2010). The difficulties mentioned above faced by students are also reflected in students' mean post-test scores employing Heaviside's cover-up method as the scores obtained are somewhat higher than their mean post-test scores using the undetermined coefficients method, as shown in Tables 2 and 3.

The discussions on the findings obtained in this study have indicated the promising potential in raising the students' performance, particularly in terms of computing competence and getting accurate solutions when solving coefficient partial fraction decomposition problems using the

improved version of the Heaviside's cover-up method in view of the progress made in the students' performance after having learnt this method. Furthermore, it is believed that the improved version of the Heaviside cover-up method could address the identified common mistakes made when applying the undetermined coefficients method, namely failure to solve the system linear equations and a lack of proficiency in concepts of computing fractions. In conclusion, the improved version of Heaviside's cover-up method is highly recommended to teach undergraduates in the elementary integral calculus courses. Nevertheless, this recommendation is restricted in its generalization to other contexts, both nationally and internationally, since samples were drawn from only two faculties in a public university in Sarawak. Despite this limitation, this study provides insights into the impact of applying two different PFD methods on students' academic performance. The researchers of this study hope to create awareness among the instructors in their choices to teach students PFD with the belief that different instructional methods may drive students to explore and understand partial fractions to bring out the best in their PFD performance. Future research should examine the replication of the findings on different PFD methods at other universities with larger sample sizes. Such studies/research could serve as an instructional development to the small research group and instructors in this area concerning PFD methods on the academic performance of students.

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APPENDIX

Appendix 1: Student Assessment

UNIVERSITI TEKNOLOGI MARA

ASSESSMENT

COURSE	:	**CALCULUS II**
COURSE CODE	:	**MAT238/235**
DATE	:	**FEBRUARY 2020/2021**
DURATION	:	**1 Hour**

INSTRUCTIONS TO CANDIDATES

1. This examination consists of **THREE** questions.

2. Answer **ALL** questions in English. Show all the necessary working solutions.

3. Every sheet of paper **MUST** include your **name, ID, group, lecturer's name, and date**.

Use **the undetermined coefficients method** and **the improved Heaviside's cover-up method** to decompose the following proper rational functions.

Question 1

Find the partial fraction expansion of the proper rational function for distinct linear polynomial denominator, $G(x) = \dfrac{1-2x}{6x^2 + x - 1}$.

Question 2

Find the partial fraction expansion of the proper rational function for repeated linear polynomial denominator, $G(x) = \dfrac{3+4x}{(x)(x+5)^2}$.

Question 3

Find the partial fraction expansion of the proper rational function for irreducible quadratic polynomial denominator, $G(x) = \dfrac{2-5x}{(x)(x^2+16)}$.

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Effectiveness of *Kami Prihatin* Charity Programme During the COVID-19 Outbreak

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ABSTRACT

The standard of living has a significant impact on one's quality of life. However, as the standard of living rises, so will consumer spending on products due to rising commodity costs. As a result, low-income households (B40) and needy people face difficulties. The government and non-governmental organizations have established many charity programmes to address this issue. Thus, the purpose of this study is to assess the effectiveness of a charity programme, Kami Prihatin 4.0, in assisting people in need during the COVID-19 outbreak. In total, 143 respondents participated in the study. A set of questionnaire was prepared to collect all of the essential data. The questionnaire was adapted from previous study which originally used to used to gauge the perception of charitable giving in general. The questionnaire is divided into five sections. The sections comprise of demographic profile of the respondents, general perception, progamme's donation, progamme's flow and regarding the understanding of speech about COVID-19. Before the programme began, each participant was handed one per individual, which was subsequently collected when the session ended. The findings revealed that the majority of the participants have positive feelings about the programme because it benefits not only them but also the organizer. Furthermore, the participants agreed that this programme should be held even during the COVID-19 pandemic. The majority of them would be more likely to attend the programme even during a crisis. This study demonstrates that charity programmes have a positive influence on low-income families. As a result, efforts to aid poor people during a crisis are critical to alleviating their suffering.

1. INTRODUCTION

Malaysia is one of the developing countries in South East Asia. As the country thrives to become more modernised, it will affect the standard of living. According to Wawrzyniak (2016), standard of living defined as the entirety of people's actual living conditions, as well as the degree to which their material and cultural requirements are met through the flow of chargeable goods and services, as well as those provided by social funds. As a country is developing over time, the standard of living will also increase. According to Aqmin et al. (2018), while the income growth of Malaysia outpaces inflation year after year, the standard of living increases at a surprisingly fast rate, as demonstrated by high expenditure elasticities for a variety of products for the B40 group. According to Che Rose and Mutsamy (2020), the B40 group known as the Bottom 40 is the lowest income group of households with an average monthly household income below RM3860. As the price of goods increases, this group will receive a heavier impact than the higher income group. As expenditure towards goods become higher, it will affect the price of goods due to higher demands. This can be proven as according to Mahidin (2021) in the Department of Statistics Malaysia Press Release Consumer Price Index (CPI) January (2021); Food and Non-Alcoholic Beverages price index rose by 1.5% to 136.1 compared to 134.1 in January 2020. In comparison to December 2020, the CPI increased by 1.2% every month. The increment was due to transportation (3.7%), housing, water, electricity, gas & other fuels (2.6%), furnishings, household equipment & routine household maintenance (0.3%), and food & non-alcoholic beverages (0.2%).

As such, the increment of goods has negative impacts on the population's wages. Their buying power declines, living conditions suffer, and society's real income decreases because of increased spending (Che Rose & Mutsamy, 2020). On top of that, the COVID-19 pandemic makes the situation even worse. The pandemic has had a direct impact on income due to premature fatalities, workplace absenteeism, and productivity losses, as well as a negative supply shock, with manufacturing activity stalling due to worldwide supply chain disruptions and factory closures. Since the Nationwide Movement Control Order began, both Penang City Council and Seberang Perai City Council local authorities have ordered the temporary closure of about 1,600 premises, including factories, restaurants, food courts, markets, and others, according to the Executive Councillor of Penang state government Jagdeep Singh Deo (Astro Awani, 2021). As the supply of goods declines and the demand for the items keeps rising, it also becomes another factor in the price of the goods. These problems become more excruciating for those who belong in the *Asnaf* group. *Asnaf* refers to eligible people to receive the Muslim tithe or "zakat" assistance collected from Muslims.

To curb this issue, Universiti Teknologi MARA (UiTM) Cawangan Pulau Pinang, Permatang Pauh Campus held a charity programme called *Kami Prihatin 4.0* in 2021 to give donations in the form of daily necessities in the area of Permatang Pauh, Penang, Malaysia. As the COVID-19 outbreak continues to run its course in the same year, *Kami Prihatin 4.0* also donated the COVID-19 kit along with a talk regarding COVID-19 prevention measures, health procedures as well as new normative practices. *Kami Prihatin 4.0* programme was held on 24 April 2021. This programme aims to help some people who have problems in obtaining necessary needs. Another purpose of this programme is to help some Muslims in Penang to prepare for Ramadan and Syawal celebrations, especially the elderly and individuals who have no source of income due to health problems and others.

Every participant will get donations such as a pack of rice, cooking oil, flour, eggs, sugar, coffee, among others. Cash was also given based on the situation and circumstances of the family during the visit. This programme will also help strengthen the relationship between the

industry and alumni as one of the collaborations to create a caring community and instil a culture of helping each other among UiTM residents, especially among Muslims, when celebrating the month of Ramadan. The programme donates to single mothers, cleaning and landscaping contract staff, senior citizens around the campus in Permatang Pauh, retired UiTM and B40 staff, B40 Pre-Higher Education students and UiTM Penang Branch students who belong to the B40 group. The study's main purpose is to identify the effectiveness of *Kami Prihatin 4.0* in helping needy people located at Permatang Pauh, Penang, Malaysia. The study becomes more crucial as the COVID-19 outbreak affects the local community within the vicinity. Thus, this study aims to describe the local comunity perceptions towards the *Kami Prihatin 4.0* program.

2. LITERATURE REVIEW

2.1 Standard of Living

Often, the level of life is conceived in strictly material terms such as the commodities and services at one's disposal early in the post-World War II period. As a result of this approach, real Gross Domestic Product (GDP) per capita became the fundamental indicator of standard of living (Easterlin, 2000). However, Wawrzyniak (2016), defined it as the entirety of people's actual living conditions, as well as the degree to which their material and cultural requirements are met through the flow of chargeable goods and services, as well as those provided by social funds. According to Njiru and Letema (2018), the standard of living refers to the level of welfare that an individual or a group of people can have. Often, the standard of living involves the goods and services that people buy or use and their resources. Several factors influence one's standard of living, including wages, poverty rate, housing quality and affordability, gross domestic product, inflation rate, affordable healthcare, education quality and availability, and life expectancy.

Although the standard of living increases from time to time, the level of standard is different in each country or state. According to Wawrzyniak (2016), who studied the standard of living in each country in the European Union found that Austria, Finland, Germany and Sweden have the highest standard of living. In contrast, Spain, Malta, Croatia and Romania have a lower standard of living. Meanwhile, Poland ranked 20th place in terms of standard of living in the European Union. This research showed that although these countries belong to Europe, each country has their standard of living. Likewise, the same can also be said for Malaysia. According to Booth (2019), the Human Development Index (HDI) was used to assess the standard of living in Southeast Asia. The HDI is a weighted average of GDP per capita, life expectancy, adult literacy, and years of schooling. In 2015, Singapore was ranked fifth globally by this measure, Malaysia was ranked 59th, and Myanmar was ranked 145th. According to Bahari and Ismail (2018), the basic needs budget is slightly different in Kuala Lumpur, Johor Baharu and George Town.

Furthermore, there is a difference in the basic needs budget between single adults in Kuala Lumpur and Johor Bahru and two working parent families among the three major cities. The basic needs budget refers to the cost of living. It is mentioned because it is a good indicator of the standard of living as living standards often involve the expenditure of goods and services. According to Latimaha et al. (2020), there is evidence of unidirectional Granger causality between the cost of living and the quality of living. Additionally, the study discovered that the lagged values of the cost of living could be used to estimate better the standard of living rather than using the lagged values of the standard of living.

2.2 Asnaf Group

In Islam, the aspects of development and poverty eradication are also topics of concern. The allocation of charitable funds to the poor and vulnerable is one of the steps to ensuring the agenda's progress. The teachings of Islam also require that efforts to eradicate poverty be a responsibility of the entire person, the private sector, and even the government. The act of helping someone in need is encouraged in Islam as expressed by Allah SWT through his words in surah at-Taubah:

> *"The alms are only for the poor and the needy, and those who collect them, and those whose hearts are to be reconciled, and to free the captives and the debtors, and for the cause of Allah, and (for) the wayfarers; a duty imposed by Allah. Allah is knower, Wise". Surah at-Taubah 9:60*

In Islam, a group that needs to get help is called *Asnaf*. The *Asnaf* is a group of eligible people to receive the Muslim tithe or *"zakat,"* assistance collected from Muslims. Surah at-Taubah above explains that there are eight groups in *Asnaf* identified as the *faqr* (poor), *miskin* (needy), *amil* (Zakat administrator), *muallaf* (newly Muslim converts), *riqab* (slave), *gharimin* (those in debt), *fisabilillah* (those striving to maintain and increase appreciation of Islam) and *ibnussabil* (the wayfarer) of whom Muslim should help (Abdullah & Jabatan Kemajuan Islam Malaysia, 2007). One of the practices to help this group is through Zakat distribution. In 2019, Lembaga Zakat Selangor (LZS) distributed RM829.9 million compared to RM616.5 million in 2018 (NST Leader: Finding Asnaf, 2019).

2.3 B40 Household

In Malaysia, the B40 group of households is likely to face a financial crisis. According to Che Rose and Mutsamy (2020), the B40 group known as the Bottom 40 is the lowest income group of households with an average monthly household income of less than RM3860. As a result of the financial crisis, they will become more indebted, which will affect their financial management in the future due to their low salaries (Dicky et al., 2019). Chamhuri et al. (2019) stated that urban areas had a higher concentration of B40 homes, with a percentage of 65%, compared to rural areas, which had just 35%. In addition, the priority in achieving zero poverty from various dimensions is given to the B40 household to achieve sustainable development goals by 2030 (United Nations, 2016).

2.4 Daily Necessities Food

Food is one of the basic human survival needs. A diversified and balanced diet can give a variety of energy and nutrients and aid in preserving general health and providing enough energy for everyday functions. A diet rich in grains, fruits and vegetables, meat, fish, poultry, legumes, and dairy products provides the human body with the required proteins, carbs, lipids, vitamins, and minerals. A nutritious diet can help prevent malnutrition in all of its manifestations and non-communicable diseases (NCDs) like diabetes, heart disease, stroke, and cancer (Healthy Diet, 2020).

Nevertheless, diets vary from place to place. According to Ramli and Jamaludin (2011), society's diet is related to previous generations' experiences, passed down from generation to generation. Europeans, for example, eat a lot of wheat-based foods like bread, pies, and pizza, but Asians prefer rice-based cuisine like rice, laksa, and so on.

2.5 Standard Operating Procedure

Standard Operating Procedure (SOP) is mandatory in holding any events. The SOP must provide clear, precise, and logical instructions, which include enough details for a person unfamiliar with the technique to understand and perform it in a consistent manner. Ideal SOPs are like recipes that are simple to follow once the necessary ingredients or resources are available. They should not be teaching or be treated as *"laboratory"* guides that include substantial theory discussions and directions but rather concise step-by-step instructions (Tuck et al., 2008).

As COVID-19 shook the world, certain instructions must be upheld to ensure that the government and non-government sectors operate during this outbreak. The Malaysia Government Movement Control Order (MCO) is a set of nationwide quarantine and cordon sanitaire measures enacted by Malaysia's federal government in response to the COVID-19 pandemic, which began on 18 March 2020. The directives was introduced to combat the spread of COVID-19 which include limitations on mobility, assembly, and international travel, as well as the closure of businesses, industries, government, and educational institutions (Malaysian Movement Control Order, 2021).

3. RESEARCH METHODOLOGY

3.1 Study Sample

A total of 350 participants participated in the *Kami Prihatin 4.0* programme. The sample size obtained for this study was calculated using a formula introduced by Wan Husin and Nordin (n.d.). The formula was used to obtain the minimum sample size for the given study. The sample size was calculated with a 0.1 level of significance and a 7% margin of error as follows:

$$n = \frac{z_{\alpha/2}^2}{4e^2}$$

$$n = \frac{z_{0.1/2}^2}{4(0.07)^2}$$

$$n = \frac{z_{0.05}^2}{0.0196}$$

$$n = \frac{(1.6449)^2}{0.0196}$$

$$n = \frac{2.7057}{0.0196}$$

$$n = 138.046 \quad \approx 139$$

$n = the\ minimum\ sample\ size$
$z = the\ z-score\ coresponding\ to$
$\quad the\ selected\ level\ of\ confidence$
$e = allowance\ error$

Based on the sample size calculation, this study required a sample size of at least 139 respondents. On the day of the programme, only 150 of the total participants came to the initial ceremony of the programme due to the Standard Operating Procedure (SOP) of the COVID-19 outbreak. In contrast, the rest of the participants had their donations delivered to them. Hence, the 150 participants acted as the sample size for this study. However, seven respondents did not answer the questionnaire completely; thus, only 143 respondents were used in this study. Table 1 shows the socio-demography profile of the respondents.

Table 1. Demographic Profile of Respondents

Characteristic	Group	Cases	Percentage (%)
Gender	1) Male	36	25.2
	2) Female	107	74.8
Age	1) Below 20 years old	3	2.1
	2) 21 – 30 years old	10	7
	3) 31 – 40 years old	12	8.4
	4) 41 – 50 years old	35	24.5
	5) 51 – 60 years old	48	33.6
	6) 61 years old and above	35	24.5
Marital Status	1) Single	23	16.1
	2) Married	92	64.3
	3) Widowed	28	19.6
Household Income	1) Below RM1000	25	17.5
	2) RM1001 – RM2000	103	72
	3) RM2001 – RM3000	15	10.5
Number of Family Members	1) 1	12	8.4
	2) 2	8	5.6
	3) 3	16	11.2
	4) 4	25	17.5
	5) 5	45	31.5
	6) 6	18	12.6
	7) 7	9	6.3
	8) 8	7	4.9
	9) 11	2	1.4
	10) 12	1	0.7
Received donation from the previous *Kami Prihatin* programme	1) Yes	110	76.9
	2) No	33	23.1

The total number of respondents was 143 consisting of 36 males (25.2%) and 107 females (74.8%). Most of the participants belonged to the 51 – 60 years old group (33.6%). 64.3% of the respondents were married, 28% were widowed, and the rest were single. The profile stated that most (72%) respondents had a household income between MYR1001 and MYR2000. The table also indicates that most respondents had five (5) family members (31.5%), while a small percentage of the respondents had family members of more than 10. There were two (2) respondents (1.4%) that had 11 family members, and one (1) respondent (0.7%) had 12 family members. Lastly, the demographic profile revealed that most respondents had previously received donations from the *Kami Prihatin 4.0* programme (76.9%). The rest of the respondents (23.1%) had received donations from this programme for the first time.

3.2 Research Instruments

A set of questionnaires was created to get all the necessary information. The questionnaire consisted of five main parts. The first part was about the demographic profile of the participant. The second part was about the general perspective of the *Kami Prihatin 4.0*. The third part was about the donations of the programme. The fourth part was about the flow of the programme

during that time. The second until the fifth section consisted of Likert scale questions to indicate their level of agreement with the given statements. According to Nemoto and Beglar (2014), a Likert scale is a psychometric scale with numerous categories. Respondents can choose to express their opinions, attitudes, or feelings regarding a certain problem. In the subject of Service Level-Agreement (SLA), Likert-scale questionnaires have been mostly employed in studies on individual difference factors like motivation, anxiety, and self-confidence.

The questionnaire was adapted from a previous study originally used to gauge the perception of charitable giving in general (Friday & Meyer, 2016). The original questionnaire comprises eight items that collect information regarding the importance of charity programmes in ensuring community betterment, strengthening the organization's public image, and focusing on the needs of individuals. Therefore, the questionnaire items were modified to be used in *Kami Prihatin 4.0* specifically. Moreover, several additional items were also added to inspect the effectiveness of the programme further. The items added were about the programme operation during the COVID-19 outbreak and the understanding of the COVID-19 speech during the programme. The items were added to identify the effectiveness of the programme during a crisis.

3.3 Data Collection procedure

The questionnaires had been printed and turned into a booklet. Each of the *Kami Prihatin 4.0* participants had been given one booklet per person before the start of the programme. The questionnaire booklets were collected after the COVID-19 speech. Several volunteers had been appointed for the collection of the questionnaire from the respondents.

3.4 Data Analysis

The data had been analyzed using IBM Statistics Package for Social Science (SPSS) version 26 for Windows. The data are presented in terms of the mean score of each question. The average score was used to determine the average participant perceptions regarding the statements in each section.

4. RESULT AND DISCUSSION

4.1 Overall Perception on Kami Prihatin 4.0 Charity Programme

Kami Prihatin 4.0 programme was created to help people in need. Hence it essentially portrays an act of goodwill and sets an example towards the community regarding good deeds that humans can do to society. Because of that, the perspective of the recipient of the donation should be studied to find out their thoughts about the image portrayed in this programme. Hence, this section discusses the awareness that *Kami Prihatin 4.0* can give to society. The awareness studied includes the awareness of charity work among society, its impact on strengthening the relationship between UiTM residents with alumni, industry and society, and the impact on the receivers.

Table 2 displays three statements representing the respondents' awareness of the *Kami Prihatin 4.0* programme. The table shows that the participants agreed that holding *Kami Prihatin 4.0* could increase public awareness and understanding of the importance of charity work in helping someone in need. It is shown in the table with a mean of 4.79 that represents the statement. One hundred thirty of the participants (90.9%) agreed with the statement, which indicated that most of them believed that *Kami Prihatin 4.0* did not only have the sole purpose of helping other

people, but it also sets an example for other parties to do a good deed to the society. Besides that, this kind of programme is also beneficial to companies. Besides creating favourable stakeholder perceptions and better support behaviours such as purchase, finding jobs, and investing in the business by participating in the activities, companies can also develop their corporate image, improve stakeholder–company relationships, and enhance stakeholders' advocacy behaviours in the long run (Du et al., 2010).

Table 2. General Perception about the Charity Programme

Statements	Mean
Kami Prihatin 4.0 programme can increase public awareness and understanding of charity work.	4.79
Kami Prihatin 4.0 can strengthen the relationship between UiTM residents, alumni, industry, and society.	4.76
In general, *Kami Prihatin 4.0* programme is beneficial to me.	4.81

Aside from that, participants also believed that this programme could strengthen the relationship between UiTM residents with alumni, industry, and society. A mean of 4.76 shows an average of the participants scoring between 4 and 5, as indicated by their selection of "slightly agree" and "strongly agree", respectively. This statement was agreed by most of the participants, with 125 participants (87.4%) who strongly agreed and 11 participants (7.7%) who slightly agreed with the statement. As the programme was held by UiTM Cawangan Pulau Pinang, Permatang Pauh Campus, it helps the institution to identify the people in need at Permatang Pauh. Thus, the relationship between UiTM and the community of Permatang Pauh can be established.

Next, aside from creating social awareness and strengthening relationships, the *Kami Prihatin 4.0* programme benefited the receivers. As revealed in the mean score of 4.81, most participants agreed with the statement, the highest mean among the statements. In addition, 129 participants (90.2%) also strongly agreed with this statement, which shows that their donations brought positive values to their lives. Overall, participants' perspective toward *Kami Prihatin 4.0* was very positive as they believed that this programme brought many benefits to society and themselves.

4.2 Perception on Donations Received from Kami Prihatin 4.0 Charity Programme

Kami Prihatin 4.0 was a donation programme conducted by UiTM Cawangan Pulau Pinang, Permatang Pauh Campus. Therefore the donation was the key aspect of the programme. The conducted analysis regarding the donation given to the participants of this programme is essential to ensure that the donation given could help them. Therefore, this section explains the participants' feelings upon receiving the donations, the ease of burden upon receiving the donation, and its importance for their daily necessities based on the donations given during *Kami Prihatin 4.0*.

Table 3 shows the statements used in analyzing the participants' perspectives on the donations. It was found that the majority of the participants felt happy when they received the donations, as indicated in the mean value of 4.92. There were 135 participants (94.4%) who strongly agreed with the statement. Furthermore, the majority of respondents (95.1%) strongly agreed that the donation they received could ease their burden. For this reason, accepting donations could reduce their daily expenditure for a short period, and the donation was also crucial during inflation. According to Oxford Learner's Dictionaries, inflation is defined as a general rise in

the prices of services and goods in a particular country, resulting in a fall in the value of money. Increasing item prices such as vegetables, meat, and other daily necessities can greatly impact those with low household income and the *Asnaf* group.

Table 3. Perceptions about Receiving Donations

Statements	Mean
I feel happy to receive donations through *Kami Prihatin 4.0*.	4.92
This donation can help ease my burden.	4.91
The donations given through *Kami Prihatin 4.0* are important daily necessities.	4.85

Table 3 also indicates the average score given on the perspective of whether the donation can help the participants with their daily necessities or not. The majority of the participants (91.6%) highly agreed that the donation helped them in daily necessities. It can also be seen in the table as 4.85 was the mean value, which means the score four (4) and five (5) are the average scores given by the participants to this statement. Daily necessities refer to items that are important and used daily in making daily meals such as breakfast, lunch and dinner. Giving daily necessities is the right choice because these items are the most important compared to other unnecessary items. Moreover, according to Mahidin (2021) in the Department of Statistics Malaysia Press Release Consumer Price Index (CPI) January (2021), Food and Non-Alcoholic Beverages price index rose by 1.5% to 136.1 compared to 134.1 in January 2020. Thus, providing essential items that its price keeps increasing is crucial in helping them.

4.3 Perception on Kami Prihatin 4.0 Charity Programme Work Flow

Analyzing the programme's operation is important to ensure that the upcoming programme can be handled as smoothly as possible. Hence, this section discusses the flow of the event and the continuity of the programme in the future. This section consists of three statements that discuss the timing of handling the programme, the flow of the programme, and the possibility of hosting it annually.

Time is the continuation of events from the past to the future. Since time is important and priceless, it should not be wasted. The participants' perspective on time management during *Kami Prihatin 4.0* should be analyzed to handle future programmes more time-efficient. From table 4, most participants (88.1%) strongly agreed that *Kami Prihatin 4.0* ran without wasting any time with the mean value of 4.80. It implies that the participants who arrived at the programme waited for a considerable time before the start of the programme. It was essential to ensure that the participants did not feel bored during the programme.

Aside from ensuring that the programme ran in a timely manner with no wasted time, the programme's agenda should also run smoothly without any hiccups. The statement in the table discussed the participants' perspectives regarding this area. It was found that the average score that the participants gave to the statement was 4.86, which is relatively high. It indicates that they agreed that *Kami Prihatin 4.0* ran without any problems, as 127 participants (88.8%) strongly agreed with this statement.

The third statement is about whether *Kami Prihatin 4.0* should be held yearly. *Kami Prihatin 4.0* is a beneficial programme to both participants and the organizer. While the participants received donations that could ease their burden, the organizer also received the positive outcome of the programme as it helped to portray a positive image of the organizer and helped enhance the organizer's reputation. From the table, the mean score for the statement regarding

holding the programme each year had the highest mean of 4.90, and 136 participants (95.1%) strongly agreed. It shows that *Kami Prihatin 4.0* is a programme that is favourable by the participants, and it should be classified as an important programme that should be held with utmost diligence.

Table 4. Perceptions about the Flow of the Charity Programme

Statements	Mean
The *Kami Prihatin 4.0* programme this time run in a timely manner.	4.80
In my opinion, the *Kami Prihatin 4.0* programme is run smoothly and orderly.	4.86
I hope the *Kami Prihatin 4.0* programme is held each year.	4.90

4.4 Perception on Kami Prihatin 4.0 Charity Programme during COVID-19

Coronavirus disease is a contagious infection caused by a newly identified coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without special care. People over 65 and those with underlying medical conditions such as cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to experience severe illness (*Coronavirus*, 2020). Consequently, conducting any event during this chaotic period is difficult as many rules must be upheld to ensure that nobody got infected with the virus. Thus, this section discusses how *Kami Prihatin 4.0* was being held during the COVID-19 outbreak.

Since the COVID-19 disease spreads across the world, Standard Operating Procedure (SOP) has been introduced. SOP is an organization's compilation of step-by-step guidelines to assist personnel in carrying out routine operations. SOP helps to lower the COVID-19 infection by following a set of rules. The first statement in table 5 is about how *Kami Prihatin 4.0* conducted its SOP. According to the table, the average score that the participants gave was 4.90. Most of the participants (94.4%) strongly agreed that *Kami Prihatin 4.0* followed the SOP stated by the National Security Council and the Ministry of Health Malaysia. Standard operating procedures must provide systematic, detailed, and reasonable guidance. It should have enough information for someone new to the procedure to understand the steps and reliably execute the procedure (Tuck et al., 2008).

Next, the second statement is about the participants' willingness to participate in a programme that involves a crowded environment. Surprisingly, 114 participants (79.7%) strongly agreed that they were willing to participate even during this outbreak. It shows that the majority of the participants are highly concerned regarding the donations that they could obtain. As the mean of this statement is 4.56, some participants (11.2%) disagreed with the statement as they believed it was not worth risking their lives for temporary relief.

A majority of participants were willing to attend the programme even in a crowded environment. Most of the participants (71.3%) also strongly agreed that *Kami Prihatin 4.0* should be held even during the COVID-19 outbreak, with an average score of 4.48 for the statement. It indicates that the donation is crucial for them even during the COVID-19. This shows that whether there exists an outbreak or not, they still depend on assistance to ease their burden. Even more so during the outbreak, some people suffer from losing their job. Between January and 27 November 2020, the Employment Insurance System (SIP) reported that 99,696 employees were laid off due to the COVID-19 outbreak. According to Awang Hashim, Deputy Minister of Human Resources, the layoffs involve highly qualified workers, with each group of

managers affecting 13,109 people; specialists (26,079 people); and technicians, as well as allied professionals (19,095 people) (Astro Awani, 2020).

Kami Prihatin 4.0 had an additional agenda compared to the past event, which was delivering a thorough speech regarding the COVID-19 outbreak to the participants. The speech consisted of up-to-date information, prevention measures and vaccination of the disease. The aim was to make sure that all the participants received donations and important information regarding COVID-19. For the general information regarding COVID-19, the participants gave an average score of 4.77, which indicates that they understood the information provided during the programme. There were 124 participants (86.7%) who strongly agreed with the statements. Most of the participants also gave high scores for the prevention measure, resulting in an average score of 4.79. It shows that the participants understood the prevention measures that they must know to prevent them from getting infected with the virus.

Lastly, the speech regarding vaccination was also being analyzed to ascertain that the participants understood its benefits and eliminate negative feelings regarding the virus. Vaccination is the application of a vaccine to assist the immune system in developing immunity to a disease (Vaccination, 2021). Table 5 shows the participant's perspectives regarding COVID-19 vaccination with an average score of 4.75, indicating the receivers understood the benefits of vaccination. Despite the benefit, 2.8% of the participants still disagreed with the statement. It suggested that a small percentage of the participants still refused to accept the vaccination.

Table 5. Perceptions about the Charity Programme During COVID-19

Statements	Mean
This time, the *Kami Prihatin 4.0* programme was carried out in accordance with Standard Operation Procedure (SOP).	4.90
I am willing to attend the *Kami Prihatin 4.0* programme, which involved many visitors even during the COVID-19 outbreak.	4.56
The *Kami Prihatin 4.0* programme must be held even during the COVID-19 outbreak.	4.48
By attending the *Kami Prihatin 4.0* programme, I gained a better understanding of the COVID-19 epidemic.	4.77
By attending the *Kami Prihatin 4.0* programme, I gained a better understanding of the COVID-19 outbreak prevention measures.	4.79
By attending the *Kami Prihatin 4.0* programme, I gained a better understanding of the COVID-19 pandemic vaccine.	4.75

5. CONCLUSION

This study examined participants' perspectives on the charity programme conducted by UiTM Cawangan Pulau Pinang, Permatang Pauh Campus, under *Kami Prihatin 4.0*. The programme was established to provide donations for people in need in Permatang Pauh, Penang, Malaysia. Most of the participants had positive opinions on the programme. It is beneficial for them and serves as a catalyst for initiating the spirit of charity in the community. The majority of them felt happy about the donation as it could help them ease their burden since it consisted of important daily items such as rice, malt drinks and oil. The participants gave positive responses to how *Kami Prihatin 4.0* operated. They agreed that the programme ran smoothly and according to the scheduled time as conveyed to the participants before the beginning of the programme. Furthermore, they also believed that the programme should also be held each year.

It indicates the elements of dependence on the programme as it comforts them with the difficulties they face. Lastly, the *Kami Prihatin 4.0* speech slot regarding the COVID-19 crisis was also conducted. The speech results showed that the programme participants understood the up-to-date information, prevention measures and vaccination of the COVID-19. As the finding strongly emphasizes the importance of charity programme, it also indicates that there should be an initiative to help needy people to increase their income so that they can live without having to depend on the donation by others strongly. Accordingly, the government or non-government organizations should take proactive actions by providing appropriate schemes or programmes regarding this issue.

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APPENDIX

Appendix 1: Survey Instrument

Variable	Item	Code	Cronbach alpha
Perceptions about Charity Programme	*Kami Prihatin* 4.0 programme can increase public awareness and understanding of charity work.	PG1	
	Kami Prihatin 4.0 can strengthen the relationship between UiTM residents, alumni, industry, and society.	PG2	0.875
	In general, *Kami Prihatin 4.0* programme is beneficial to me.	PG3	
Receiving Donation	I feel happy to receive donations through *Kami Prihatin 4.0*.	PD1	
	This donation can help ease my burden.	PD2	0.960
	The donations given through *Kami Prihatin 4.0* are important daily necessities.	PD3	
Charity Programme Flow	The *Kami Prihatin 4.0* programme this time run in a timely manner.	PF1	
	In my opinion, the Kami Prihatin 4.0 programme is run smoothly and orderly.	PF2	0.952
	I hope the *Kami Prihatin 4.0* programme is held each year.	PF3	
Charity Programme during COVID-19	This time, the *Kami Prihatin 4.0* programme was carried out in accordance with Standard Operation Procedure (SOP).	PC1	
	I am willing to attend the *Kami Prihatin 4.0* programme, which involved many visitors even during the COVID-19 outbreak.	PC2	0.934
	The *Kami Prihatin 4.0* programme must be held even during the COVID-19 outbreak.	PC3	
	By attending the *Kami Prihatin 4.0* programme, I gained a better understanding of the COVID-19 epidemic.	PC4	
	By attending the *Kami Prihatin 4.0* programme, I gained a better understanding of the COVID-19 outbreak prevention measures.	PC5	
	By attending the *Kami Prihatin 4.0* programme, I gained a better understanding of the COVID-19 pandemic vaccine.	PC6	

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Examining the Relationship between Food Insecurity and Students' Academic Performance in Public Universities

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ABSTRACT

This study examines the relationship between food insecurity and academic performances among university students in Selangor, Malaysia. Food insecurity exists whenever people have limited food access at all times for an active and healthy life. In the case of Malaysians, their multicultural identity has expanded their palate and surrounded them with various food choices in their daily life. However, only a few are well-informed of the story behind food production and its quality. Limited knowledge and understanding of health, particularly daily dietary food intake, might slowly make people descend to food insecurity. Therefore, it is essential to understand the consequences of this issue. A total of 400 survey data using a self-administrated questionnaire were collected among students across public universities in Selangor, Malaysia. Statistical analysis revealed that food quality significantly influences students' academic performances. Students at a lower risk of food insecurity included those who reported living with their parents and those who received monthly allowances from government agencies and their parents. In addition, food-secure students were more likely than food-insecure students to report a higher GPA versus a lower GPA. These findings compel relevant authorities, including university and food-related service providers, to consider the importance of food quality and students' amount of food intake as these factors significantly influence their academic performances. Therefore, this study suggests further investigation with a combination of various study settings and scope probably could gain a deeper understanding of and refine the existing theory of human belief towards food consumption.

1. INTRODUCTION

Many studies found that food insecurity is a multi-faceted concept that has evolved over time and place. It is conceptualised as limited or uncertain availability of nutritionally adequate and safe food or limited or uncertain ability to acquire acceptable food in socially acceptable ways (Anderson, 1990). This indicates when an individual has uncertain capacity to get food and the uncertain capability to eat nutritious food whenever they wish. The phenomenon of food insecurity has been discussed and debated by scholars within the context of teenagers who pursue their higher education at university and have to live far away from their parents to stay near campus. Food insecurity has extraordinary consequences for university students who are not invulnerable to encountering financial hardship. Numerous studies show both the degree and effects of financial stress during each study. A deficiency of an adequate measure of food prompts weight reduction and poor health, a phenomenon that influences more than a large portion of teenagers in the present day (Cheng & Kamil, 2020; Whitaker et al., 2006). Students' increased financial stress may influence their purchasing priorities, a common scenario being frequently prioritising their limited budget for housing, tuition, and utilities, leaving an insufficient balance for food and thereby putting them at risk of food insecurity (El Zein et al., 2019; Henry, 2017). Thus, many university students struggle to manage their diet while studying at university by worrying about meals or dishes they buy and consume.

In Malaysia, food insecurity has been observed amongst the communities of higher educational institutions, particularly the students. The country is reported to have 20 well-established public universities and a total enrolment of 567, 625 students in 2019 (Malaysia Education Planning and Research Division, 2020). The escalating number of universities opens equilibrium to more opportunities for youngsters from diverse backgrounds to pursue post-secondary education. Those who come from low-income families, on the other hand, may find it difficult to adjust to campus life. As a result, their issues with financial stability, packed daily class schedules and activities, and insufficient attention on proper and balanced food intake to stay fit have become research topics of interest to academics. Furthermore, severe sickness due to the consumption or high intake of low nutrient and quality food among Malaysians, the young age groups included, is the repercussion of food insecurity and poor health (Sulaiman et al., 2021). This was supported by a recent study by Cheng and Kamil (2020), who found that students themselves are the core reason for their altered food consumption behaviour. Often, Malaysian university students who are pressured to study and maintain their academic achievements consume food with low energy, fat and calcium. This behaviour, if continuously practised, would lend a negative impact on both their health as well as their academic performances (Cheng & Kamil, 2020).

In light of the current scenario of Malaysian universities, the rising cost of education imposed by the Malaysian Public Higher Learning Institution is now affecting some students, and most of them come from low and middle-income families. The students' incomes come mainly from study loans or scholarships, allowances provided by their parents or part-time jobs; in other words, they are self-sponsored. The majority of them were said to earn less than Ringgit Malaysia or MYR500.00 (approximately USD119.05) per month (Muniady, 2014). Due to their limited financial resources, students must budget carefully for food, entertainment, transportation, study materials, clothing, electronic devices and rent (Sorooshian & Teck, 2014). Hence, it is difficult for students to choose between textbooks, rent, and consistently eat healthily. Also, a lack of knowledge, rather than a disregard, concerning diet, food intake and nutritional value lead most people to capitulate to food insecurity (Cady, 2014).

The sudden closure of cafeterias, limited access to personal transportation, poor food quality, and time constraints have also exacerbated the situation, further forcing students to resort to alternative methods such as purchasing food off-campus, buying instant and ready-made food from mini-marts, reducing meal portions, and eating at unhealthy food establishments such as Quick Service Restaurants to survive (Shii et al., 2015). Some of them were also discovered to have nutrient intakes lower than the Recommended Nutrient Intakes for Malaysia (Abdull Hakim et al., 2012; Gan et al., 2011; Ganasegeran et al., 2012). Thus, these factors significantly influence students' food choices and create a problem where they have to choose between eating healthily or to survive, which ultimately affects their academic achievements (Cook & Frank, 2008; Gao et al., 2009) as well as their energy and concentration levels (Hamelin et al., 1999; Zekeri, 2007). Evidence from the aforementioned studies indicates that the students' financial management skills and dietary behaviours were unacceptable. Their inconvenient surroundings and living conditions placed them at risk of developing a higher degree of complexity in food insecurity, possibly influencing their academic performances.

Based on the above rationale, there is a need for empirical investigation on food insecurity, particularly among university students. Although a few studies on food insecurity on college campuses have been carried out (Hughes et al., 2011; Patton-López et al., 2014; Pia Chaparro et al., 2009), studies scrutinising the prevalence of food insecurity amongst students and whether food insecurity is associated with academic achievement, concentration ability and energy level receive minimal attention in the syllabus and needs to be conducted. Therefore, this study examines the relationship between public university students' food insecurity and their academic performances in Selangor, Malaysia. There are two food habit predictors: food quality and food quantity, which have been set as the main focus of this study to measure the relationship specifically.

2. LITERATURE REVIEW

Students who do not have learning capability may lack the motivation to adapt and arrange and assess their learning processes as classes become more difficult in increments. This circumstance negatively influences their success in university and their lives after graduation (Pepe, 2012). Although studies on food insecurity and academic performance are limited, exploring the adverse effect of food insecurity on teenagers' academic achievements acted as a catalyst to assess the proposed study hypothesis. In terms of food insecurity and teenage advancement, it was found that most teenagers who experience food insecurity live in developed countries. As Winicki et al. (2003) have indicated, nine percent of their study population experienced food insecurity and that any level of food insecurity strongly influenced academic results within one year of learning.

2.1 Understanding the Concept of Food Insecurity

Many scholars have conducted studies on food insecurity for decades to understand human behaviour towards food consumption. Initially, the term food insecurity was introduced by World Health Organisation as a subset to the concept of food security which specifically focuses on understanding human food consumption behaviour. Wunderlich and Norwood (2006) defined food insecurity as the inadequacy or limited quality and quantity of food resources for consumption. This definition is built on two aspects: 1) quality food resources, and 2) the amount of food available (i.e., food quantity) for human consumption. Thus, food insecurity can be detected whenever there is little nutritional food for consumption, be it intentionally or otherwise. Food insecurity has been recognised as one of the most important

areas of study and has been recognised by many countries worldwide through the second goal of Sustainable Development Goals 2030 (Sulaiman et al., 2021).

Scholars have also found several indicators to measure the condition of food insecurity, including poverty status, real estate values and pressure, unemployment status of a person, lack of food and nutritional knowledge, and food habits (Holben, 2010). Food insecurity does not refer to a household's ability to access foodstuffs, living in a food desert, or insufficient time to shop or cook. It just indicates a lack of food access due to financial matters and other material resources. Because of their life practices, the population that experienced food insecurity indicated a higher risk of chronic diseases (Seligman et al., 2010). Therefore, a study on food insecurity is critical and desires more attention to better understand its condition and the consequences of ignoring its existence. This concept is also believed to apply to various age groups and population segments, especially among university students who are often reported to suffer from a lack of nutrition due to limited food access and the practice of unusual dietary habits.

2.2 Food Quality

The availability of quality food has gained serious attention and has long been discussed by many scholars. There are many studies heavily concentrated on food and service, which includes the hospitality industry. Additionally, food nutrients and food habit studies are often conducted to better understand institutional catering, especially at the school level. However, there is still little known about food quality within the context of food insecurity, particularly the relationship between food quality and students' academic performances. It is a leading public health issue. Food insecurity is identified as a profound level of food issues, while food security is a condition identified with a supply of adequate quality food (Sulaiman et al., 2021).

Within the broad concept of food quality, this is one of the significant aspects that build on food insecurity's conceptual knowledge. This condition was found in students suffering difficulty to manage their finances, which causes them to choose to either buy cheap food or big portions that have value for money (Seligman et al., 2010). This condition caused students to avoid spending an unreasonable amount on acceptable quality food. Moreover, struggling to access eateries and supermarkets restricts students' options and the desire to buy quality food. Nowadays, most food entrepreneurs have increased their prices to an unreasonable level—thus, students choose to purchase affordable food which is typically low in quality (Cheng & Kamil, 2020). These experiences will stress the students because an unbalanced food intake due to financial problems may affect their academic achievements. With little quality food, food insecurity is developed among students (Maroto, 2013; Radimer, 2002).

H1: There is positive relationship between food quality and students' academic performance.

2.3 Food Quantity

The amount of food intake and dietary habits are interrelated to ensure our body has enough nutrition. Food acts as fuel to supply energy to carry out daily life activities and maintain health. Excessive food intake causes many troubles to humans, including obesity, disease, stress, laziness, and poor concentration in class or while studying (Cheng & Kamil, 2020). With increasing financial stress and preparing for university, their finishing rates cannot differentiate them from high-income families or low-income families. Muniady et al. (2014) indicated that students must budget carefully for food, entertainment, transportation, study materials, clothing, electrical equipment, and rent because of their restricted financial resources.

American College Health Association (2011) discovered that 34% of college students found money stressful or extremely hard to handle, and that sums of cash contrarily influenced the academic execution of 6.5% of students in their analysis. The same goes for the researchers Maroto (2013) and Radimer (2002), who observed that consuming too much food causes students to lose focus and feel sleepy while in class. If students continuously practise this, there is a high chance that it would affect their academic performances.

H2: There is negative relationship between food quantity and students' academic performance.

Figure 1 illustrates the focus of this study which situated within the underpinning theories adapted from Maroto (2013) and (Radimer, 2002).
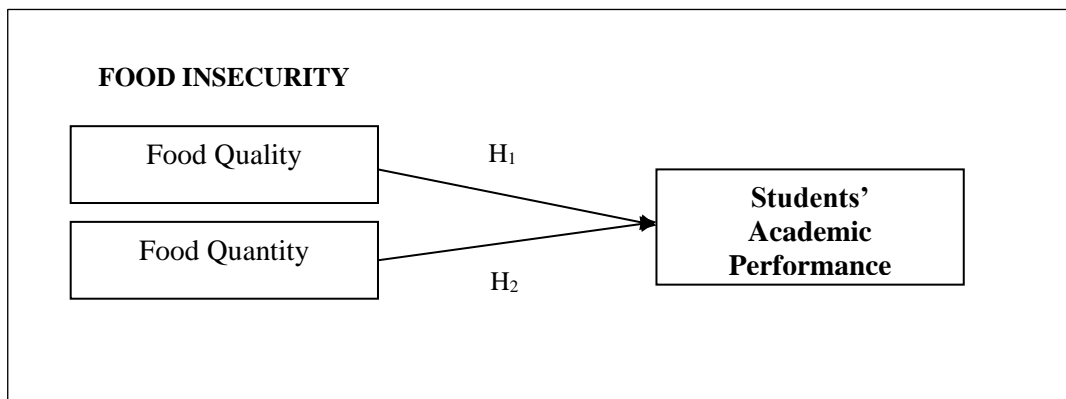

Figure 1. Underpinning Theoretical Framework

3. METHOD

This study employed a descriptive cross-sectional research design through the distribution of a self-administered questionnaire. Four public universities, namely, Universiti Teknologi MARA Cawangan Selangor, Universiti Pertahanan Nasional Malaysia, Universiti Kebangsaan Malaysia and Universiti Putra Malaysia located in Selangor, were identified from the Malaysian Qualifications Register (MQR) list published by the Malaysian Qualifications Agency (MQA). These universities were approached, and they have agreed to participate in this study. The MQA is an accreditation agency recognised and supported by the Malaysian government for quality assurance at Malaysia's public and private universities. Based on the sample size table recommended by Krejcie and Morgan (1970), the sample size of 381 respondents is considered adequate with a five percent margin error and a 95% confidence level. Nevertheless, it has been increased to 400 to avoid invalid results due to respondent errors when completing the questionnaire.

The self-administered survey questionnaire consists of four main sections. All four sections measured responses with a 5-point Likert-type scale (1 = strongly disagree, and 5 = strongly agree). The questionnaire was adapted from past studies (Maroto, 2013; Radimer, 2002) with several minor modifications to fit the study. The final section of the questionnaire collected the respondents' demographics and relevant personal information (e.g., age, gender, marital status, living situation, current semester, meal per day, monthly income, and Grade Point Average). This study was focus on public university students located in Selangor, Malaysia. A total of 400 questionnaires were distributed within one month to all four selected public universities. The targeted sample population (e.g., respondents) for this study were undergraduate and postgraduate students enrolled in full-time study. Table 1 summarises the survey distribution activities.

Table 1. A Summary of Self-Administrated Questionnaire Distribution

Public Universities	Number of questionnaires distributed	Duration	Return Rate Percentage (%)
Universiti Teknologi MARA Cawangan Selangor	200		100
Universiti Pertahanan Nasional Malaysia	50	1 month*	100
Universiti Kebangsaan Malaysia	50		100
Universiti Putra Malaysia	100		100
Total	400		100

All public universities were given one month (November 2019) to distribute and return the completed questionnaires

All questionnaires returned were checked to ensure that participating respondents fully answered every set of questionnaires. The data was transferred and keyed into Statistical Package for the Social Science (SPSS) Version 25.0 for analysis. Descriptive statistics by looking at frequency percentage and inferential test (e.g. Multiple Linear Regression - MLR) were utilised in this study. Frequency percentage enabled researchers to observe the socio-demographic profile of participating respondents. MLR, on the other hand, allowed researchers to statistically examine the relationship between public university students' food insecurity (criteria) and their academic performances (predictors).

4. FINDINGS AND DISCUSSION

4.1 Demographic Information

The demographic data were analysed with descriptive statistics consisting of frequency, percentage, mean and standard deviation using the statistical package for the social science (SPSS) version 25.0 software. All respondents (n=400) agreed to participate in this study and answered the questionnaire completely. Based on Table 2, most of the respondents were between 20 and 23 years old, which accounted for 70.5% (n=282) of the respondents. Female respondents accounted for 50.8% (n=286) while male respondents accounted for 28.5% (n=114). With regards to the level of education, the majority of respondents were undergraduate students, who account for 92.5% (n=370) of respondents while (n=30) postgraduates account for 7.5%. Undergraduate students were often reported as the majority of the university population. Additionally, it was found that there were many undergraduate programs offered at the participating universities. As for the respondents' living situations, the majority of respondents resided on campus, which accounts for 74.75% (n=299); followed by renting out, which accounts for 6 percent (n=2); living with parents, which accounts for 13.75% (n=55); and living with spouses which accounted for 5.5 percent (n=22). The majority of respondents, or 27.8% (n=23), ate three times per day, whereas the lowest was 10.3 percent (n=41), who consumed one meal per day. As for the respondents' income backgrounds, 13.5% (n=54) have an income below MYR2,500.00 (approximately USD595.23), followed by 14.75% (n=59) with incomes ranging between MYR2,501.00 - MYR3,170.00 (USD595.48 – USD754.76). This was followed by incomes ranging between MYR3,171.00 – MYR3,970.00 (USD755.00 – USD945.24), which accounted for 3.75% (n=15), and only two percent (n=8) have incomes ranging between MYR3,971.00 – MYR4,850.00 (USD945.48 – USD1,154.76). The majority of respondents, 66% (n=264), were not applicable in terms of income because the study reported that the respondents received financial assistance from parents and scholarships

(Economic Planning Unit, 2019). The Grade Point Average (GPA) revealed that the majority of respondents were in the second upper-class, which accounted for 31.5% (*n*=126), and first-class, which accounted for 25.8% (*n*=103). The lowest with less than 1.99 of accumulative points accounted for five percent (*n*=20).

Table 2. Demographic Characteristics of Respondents

Profiles	Categories	*n*	Percentage (%)
Age	18 - 23 years old	282	70.5
	24 - 28 years old	92	23
	29 - 33 years old	22	5.5
	34 years old and above	4	1
Gender	Male	114	28.5
	Female	286	71.5
Marital Status	Single	375	93.8
	Married	25	6.2
Education Level	Undergraduate	370	92.5
	Postgraduate	30	7.5
Living Situation	Campus residence	299	74.75
	Renting	24	6
	Parents house	55	13.75
	Spouse house	22	5.5
Current Semester	Semester 2-3	279	69.75
	Semester 4-5	98	24.5
	Semester 6-7	23	5.75
Meals Intake per Day	1 time	41	10.3
	2 times	107	59.3
	3 times	237	27.8
	4 times	15	2.6
Monthly Income:	<MYR2,500	54	13.5
	MYR2,501 - MYR3,170	59	14.75
	MYR3,171 - MYR3,970	15	3.75
	>MYR3,971 - MYR4,850	8	2
	Others	264	66
Grade Point Average	Less Than 1.99	20	5
	2.00 - 2.49	69	17.2
	2.50 - 2.99	82	20.5
	3.00 - 3.49	126	31.5
	3.50 - 4.00	103	25.8

4.2 Examining the Relationship by Using Multiple Linear Regression

Table 3 indicates the multiple regression output between variables involved in the study. Food quantity (*b*= -.027, *p*=.714) had a negative influence on academic performance. However, the value revealed that food quantity was low and did not influence academic performance (*p>0.05) as it only accounts for 2.7%. This shows that most students consume sufficient amounts of food daily. In addition, the location of the campus residences, which was in town areas, provided easy access to a wide range of restaurants. Thus, negative relationship between food quantity and students' academic performance has resulted H2 rejection in this study.

Based on the results on food quality (*b*= .144, *p*=.017), it is a factor that significantly affected academic performance. Food quality was the most influential predictor of the two dimensions of food insecurity (*p<0.05). This was the most pivotal factor of food insecurity that affected academic performance. This particular data disclosed that students of public universities in Selangor tended to buy unhealthy food instead of quality food because insufficient financial sources affected their everyday routines. Patton-López et al. (2014) emphasised that students felt less energetic towards their academic studies when they had unhealthy diets. Meanwhile, Whitaker et al. (2006) rationalised that food insecurity has extraordinary consequences for teenagers' strength in their daily lives, and inadequate food quality increases the risk of sickness. These findings were aligned with The Malaysian Adult Nutrition Survey's countrywide research, which found that Malaysian citizens contributed to food insecurity due to insufficient food sources and availability and the provision and consumption of quality food. Therefore, H1 of this study is accepted with positive relationship between food quality and students' academic performance.

Table 3. Multiple Regression between Food Insecurity and Students' Academic Performance

	Unstandardised Coefficients		Standardised Coefficients	T	Sig.	Hypotheses Testing
	B	Std. Error	Beta			
(Constant)	3.461	.242		14.280	.000	
Food Quality	.161	.067	.144*	2.408	.017	H_1 = Accepted
Food Quantity	-.034	.094	-.027	-.366	.714	H_2 = Rejected

Note: Dependent Variable: Academic Performance

5. CONCLUSION AND RECOMMENDATION FOR FUTURE STUDIES

In conclusion, this study confirmed that there is a positive relationship between food quality and students' academic performance., hence hypothesis 1 was supported. On the other hand, the study failed to provide empirical evidence on the significant effect of food quantity on students' academic performances. Hence, hypothesis 2 was rejected. Regardless, research on food insecurity is critical, especially to better understand the human attitude towards food. As discussed in the literature review section, the majority of students believed that they encountered dilemmas with food insecurity during their pursuit of education at a higher learning institution. Relevant scholars confirmed that food insecurity is a major health issue that has resulted in several negative consequences, including negatively impacted academic performances among students. Therefore, providing better food quality and maintaining the appearance, taste, and balanced nutrients (i.e., food quality) is crucial for students studying at public universities in Selangor, Malaysia. All these could help minimise behaviour related to food insecurity amongst those students and at the same time increase their quality of life and health.

Within the findings of this study, it seems that there are limitations of application and generalizability. Perhaps future scholars could further extend the investigation on food insecurity among university students nationwide. This would allow a better understanding of the food insecurity phenomenon in Malaysia. The findings could be generalised to the entire population of university students in the country rather than a specific area of study. Moreover, it would be more interesting to identify differences in the dietary habits between those enrolled at public and private universities or whether rural or urban areas significantly influence food insecurity among students. Different settings will result in divergent findings, and expansion

of the research is required to strengthen the body of knowledge. Finally, integrating the qualitative and quantitative approach (mixed-method study) on this topic can provide a deeper understanding of the theoretical and conceptual thoughts on food insecurity among university students and studying human behaviour. Furthermore, scholars could discover emerging attributes within the current perspective concerning modern lifestyle and the pressure of restructuring the education system to adapt to the online teaching and learning era due to uncontrollable external forces such as the current pandemic and natural disasters.

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APPENDIX

Appendix 1: Survey Instrument

Variable	Item	Code	Reliability	Sources
Food Quality	The food price was reasonably affordable.	FQL1		
	I relied on low-cost food because I do not have enough money.	FQL2	0.723	
	I could not afford to eat balanced meals.	FQL3		
	The food was eyed appealing.	FQL4		
	The food was fresh and tasty.	FQL5		
Food Quantity	I worried whether my food would run out before I have money to buy more.	FQN1		Adapted with minor modifications from Maroto (2013) and Radimer (2002)
	The food that I bought just did not last and I did not have money to get more.	FQN2		
	I eat less than I should if there was not enough money to buy the food.	FQN3	0.756	
	I will cut my meals' size or skip the meals if there was not enough money.	FQN4		
	I will not eat for the whole day if there was not enough money to buy the food.	FQN5		
Students' Academic Performance	I pay better attention in class and lecture when I eat my meals on time.	AP1		
	I feel more confident when I eat enough portion meals.	AP2	0.650	
	My concentration level in class is very good.	AP3		
	My energy level in class is very good.	AP4		

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Factors Affecting Airbnb Booking Intention among Young Malaysian Travellers

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ABSTRACT

Airbnb, a website that matches house and apartment owners with short-term tenants, was first introduced in 2008 and quickly became the most popular online accommodation booking service. Airbnb accommodations are commonly less expensive than hotels, attracting many backpackers and independent travellers. The development of Airbnb in Malaysia has raised customers' interest in staying at Airbnb, resulting in an increasing number of patrons compared to hotel customers, especially with the advancement of technology where tourists use the internet and applications to make their Airbnb booking. The study aimed to investigate the purchase intention from the perspective of young Malaysian travellers in booking Airbnb online. This study examined the influence of perceived price, quality, trust, and risk on their intentions to book Airbnb online. Survey questionnaires were distributed via a Google Form, and 129 responses were received and analysed. Regression analysis was conducted to test and support the hypotheses derived from this study. The results showed that perceived price, quality, trust, and risk influence young travellers' purchase intentions in booking Airbnb online. Of these four factors, trust has the most significant impact on young travellers' intentions to book Airbnb online. It is proven that perceived quality and trust are paramount in encouraging purchase intention for online services. The study provides insights to online travel operators on the factors to concentrate on improving their services to customers and assist them in boosting their sales in the future and achieving customer loyalty.

1. INTRODUCTION

Since its introduction in 2008, Airbnb has greatly changed the hotel industry landscape (Ert et al., 2016; Oskam & Boswijl, 2016). Currently, Airbnb has reached over 34,000 cities globally (Shuford, 2015), and in 2014, more than 155 million tourists stayed in Airbnb accommodation, nearly 22% more than Hilton Worldwide (Price Waterhouse Coopers, 2015). According to Ikkala (2014), there are two main styles of hosting through Airbnb. The first one is called small hospitality, which refers to hosting situations where the host does not physically share the property (i.e., apartment) with the guest. The second one is the on-site hospitality type, where hosts and guests share the property. In Malaysia, short-term accommodation rentals through sharing economy platforms have grown significantly, with sales totalling RM129 million. Razli et al. (2017) stated that these short-term accommodation rentals had considerably impacted the tourism lodging sector, significantly increasing the number of Airbnb guest nights booked. Airbnb's growth has accelerated in recent years due to extensive marketing campaigns by Airbnb and brand awareness in other regions.

In Malaysia, Airbnb grew by over 137% over the year with roughly 32,000 daily listings, which is considered the highest in the Asian Region (The Star Online, 2018). Airbnb is prevalent in popular tourist hotspots such as Kuala Lumpur, Penang, Port Dickson, and Ipoh. (Al Sadat Zyed et al., 2020). The incremental growth of online booking is a new trend within the tourism industry (Bhatiasevi & Yoopetch, 2015). Razli et al. (2017) reported that guests from 78 countries worldwide have travelled to Malaysia using this peer-to-peer sharing site and booked accommodation via Airbnb. Local governments have recognised its potential and benefits to the local economy, resulting in several efforts to encourage more people to use this platform. For example, in Visit Malaysia 2014, the Malaysian government has taken some initiatives to promote Airbnb to encourage tourists to book accommodations to boost the tourism industry and the local real estate market (Tourism Malaysia, 2016).

Youth travel is one of the world's fastest growing and most dynamic tourism markets. According to the World Tourism Organization (UNWTO), young people accounted for approximately 20% of all international tourist arrivals in 2010. There are 28.25 million young travellers in Malaysia (Malaysia Department of Statistics, 2010). Malaysia's 1997 National Youth Development Policy ranges from 15 to 40 years old (Azhar et al., 2020). Young Malaysians today are raised in an environment that provides a broad range of travel opportunities (Ting et al., 2015). Young travellers have high motivation and ample leisure time in visiting new destinations, despite having relatively low disposable income levels. An inexpensive and short-haul destination attracts young travellers despite the financial constraint (Jang et al., 2004). Although they have limited financial resources, young travellers have high expectations regarding the significance of value for money (Glover, 2010). They are willing to pay a higher price if they believe the goods, services, or experience is worthwhile.

Up to 2021, Airbnb has indeed become a popular choice of accommodation rental worldwide. However, the significant impact of Coronavirus Disease (COVID-19) was visible through statistics that showed a gradual increase after 21st June 2020, when the MCO restrictions became more lenient (Hirschman, 2020). Airbnb customers increased more than hotel customers due to the advancement of technology impacting every industry, especially the tourism industry. Tourists use the internet and applications to book for Airbnb (Augustine & Adnan, 2020). The Malaysian Reserve said that the rise of the Airbnb industry is because there are various hotel options here in Malaysia, especially in Kuala Lumpur. The rise of Airbnb is also one of the main reasons why customers prefer Airbnb to hotels (Augustine & Adnan, 2020).

Statistics also show that travellers made most of the Airbnb bookings within the young travellers' age range (Priporas et al., 2017). Therefore, the choices made by the young travellers must be affected by certain variables which determine their purchase intention for Airbnb (Feng, 2018). Following these revelations and the increasing listings of Airbnb in Kuala Lumpur (Ho et al., 2019), there should be an in-depth study on the purchase intentions made by Young Travellers. In-depth studies have proven that the Young Traveller market is the most prominent travellers responsible for booking Airbnb in Kuala Lumpur. This research investigates the role of Airbnb attributes and determines which Airbnb attributes influence the Malaysian young travellers' purchase intention. There are fewer studies on the Airbnb accommodation experience related to young Malaysian travellers. However, there has been an increasing interest in the customers' attributes and more suffocated theoretical explanations related to Airbnb's perceived price, quality, trust, and risk (Sthapit & Jiménez-Barreto, 2018). The revelation provides an opportunity to narrow down the field of study from the entire nation of Malaysia to Kuala Lumpur, which is the focal point of Airbnb accommodations in Malaysia. Therefore, it is essential to know if perceived price, quality, trust, and risk factors will affect young travellers' intentions to purchase Airbnb online.

2. LITERATURE REVIEW

2.1 Purchase Intention

Intention encompasses behavioural motivations to engage in the conduct. For the context of this study, the use of the Theory of Planned Behaviour (TPB) is essential as it focuses on Purchase Intention - a result of human behaviours and norms. TPB discusses how people's conduct is determined by their desire to execute a specific activity (Ashraf et al., 2019) and is frequently used to evaluate human behaviours. Furthermore, as Ashraf et al. (2019) explained, TPB asserts that the immediate antecedent of genuine action is someone's intention to participate in such behaviour. Intention encompasses behavioural motivations to engage in the conduct. Several underlying influences on a person's purchase intention will affect the intention and ultimately purchase a product or service (Gogoi, 2013).

Purchase intention refers to a customer's willingness to purchase a product or service under such circumstances (Usman & Okafor, 2019). Mirabi et al. (2015) define purchase intention as a situation where a consumer intends to buy a specific product in a particular condition. Aside from that, purchase intention is an indicator of the consumer's actual purchase decision. The product's cognitive customer status determines the plan for the customer to purchase the product or service, also known as purchase intention (Hasanov, 2015). Additionally, consumers can be affected by either internal or external motivations during the buying process (Gogoi, 2013). Research has suggested six stages before purchasing: awareness, knowledge, interest, preference, persuasion, and purchase. (Kotler & Armstrong, 2010; Kawa et al., 2013). Saleem et al. (2015) state that purchase intention is effective in predicting consumers' buying process. Thus, the study of purchase intent is critical because it allows marketers better to understand consumer behaviour.

2.2 Perceived Price

Price refers to what is sacrificed or given to purchase a good or service. Perceived price refers to a customer's evaluation of a product's value, including monetary, time, search, effort, and psychological costs (Wang & Chen, 2016). Nonetheless, price is an essential predictor of consumer purchase intentions as the perceived price is a direct and indirect predictor of

consumers' purchase intention, which ultimately affects customers' purchase behaviour (Chiang, 2014). On the other hand, an accurate monetary price is an actual price, whereas the perceived price is encoded by consumers (Wang & Chen, 2016). Pappas (2017) pointed out that Consumers sought to get the greatest possible "value for money," therefore, pricing and total spending considerations were essential in choosing accommodations, causing travellers to switch from traditional hotels and toward sharing economy accommodations. According to Mao and Lyu (2017), travellers appreciate their high service quality and low costs. In a study conducted by Guttentag (2016), most consumers think that the most compelling reason to use Airbnb is its low cost.

2.3 Perceived Quality

Perceived quality is a customer's perception of the general product or service concerning one product or service compared to other alternatives (Saleem et al., 2015). Perceived quality is characterised as the customer's perception of the general quality or superiority of one product or service compared to other products considering its expected target case (Mirabi et al., 2015). Perceived quality is a broad and intangible impression of a brand. The price is often replaced by the customer's perception of the overall quality of the product or service (Abidin, 2015). The quality of a product is determined by how well it meets the needs of its consumer, which may include a variety of features and how well it performs (Saleem et al., 2015). Mirabi et al. (2015) further add that product quality is also determined by understanding and measuring consumer needs. Therefore, customer perceived quality is a customer's perception of the quality superiority of the products (Porra, 2017). Perceived quality is an asset for a company in an online marketplace because it influences a customer's purchase intention (Navitha Sulthana & Vasantha, 2021). Thus, with the vast advancement of technology, consumers can obtain product quality information over the internet, simultaneously promoting the overall superiority of the product information globally. Moreover, Navitha Sulthana and Vasantha (2021) highlighted that consumers are particular about product quality. Hence perceived quality plays a significant role in product sales. Consumers are more encouraged to purchase a product if they believe the product is of high quality. According to Saleem et al. (2015), the customer perception of a product after usage is known as purchase intentions.

2.4 Trust

Trust is one of the most crucial aspects of the customer-seller relationship. Ert et al. (2016) stated that trust is among the most significant aspects of conducting an online transaction. Furthermore, it is based on moral responsibilities, which establish the expectations of all parties engaged in the service system, indicating that the hosts and the organisation behind the web platform (e.g., Airbnb) would behave adequately and faithfully (Tussyadiah & Park, 2018). Two strangers are unlikely to engage in a monetary transaction unless they trust one another. When customers have a higher level of trust in an online retailer, they are more likely to purchase online (Lim & Cham, 2015). According to Ert et al. (2016), guests on Airbnb use listing information such as high positive online reviews to make an online booking decision. Chen & Chang (2018) stated that a free-form text comment through which the customers describe their experience with and or perception of the service used served as a valuable reference for potential future customers.

2.5 Perceived Risk

Tourists today tend to opt for purchasing travel elements online, such as the case with Airbnb bookings and rental purchases. However, in an online environment, perceived risk is a significant influencer to consumption. Lim et al. (2019) stated that perceived risk is one of the psychological processes encountered by consumers when purchasing goods online. Therefore, perceived risks are a negative influencing factor to consumer consumption and behaviour studies. Apart from being a significant negative input to consumer behaviour studies, having a perception of risk for a product or service often induces a negative behaviour towards it (Wang et al., 2019), such as showing hindrance and reluctance to purchase (Wang et al., 2019).

For the context of this study, this would mean that tourists may not choose to rent Airbnb due to the risks it may oppose upon the tourist, such as those mentioned by the authors. Kotler and Kotler (2018), in Loh et al. (2021) 's study, also indicated that perceived risk factors include finance, functionality, physical and psychological risks. Furthermore, Airbnb bookings are made on the Airbnb website or application- an online environment anyone can access, offering a different sense of experience that may not be available in other accommodation booking options. Consumers may interpret this experience differently, as travel and tourism experiences tend to be very subjective (Loh et al., 2021). This variability would include the risks that may affect the tourists' experience before, during and after their stay, such as those mentioned by authors Loh et al. (2021). Thus, this indicates that perceived risks have a significant relationship with the purchase intention of Young Malaysian Travelers in booking Airbnb Online.

2.6 The Relationship among Variables

2.6.1 Perceived Price and Purchase Intentions

Consumers consider perceived price to be more relevant than monetary price (Bei & Chiao, 2001). Lichtenstein et al. (1993) classified perceived price into two negative and positive roles. The opposing roles are value consciousness, price consciousness, coupon proneness, sale proneness, and price mavens and the positive roles are the price-quality schema and prestige sensitivity. According to Mao and Lyu (2017), travellers appreciate their value from excellent service quality and low prices. According to Guttentag (2016) research, most consumers feel that the most significant reason to use Airbnb is its low cost. Airbnb was promoted as the concept of 'low cost' to attract customers (Ennion, 2013). According to Nicolau (2012), the research found that price sensitivity significantly impacts how travellers select their accommodation. Therefore, this study hypothesised that perceived price has a significant relationship with purchase intentions. Thus, the hypothesis proposed for H1: There is a significant relationship between perceived price and purchase intention.

2.6.2 Perceived Quality and Purchase Intention

Customer perceived quality is a customer's perception of the quality superiority of the products (Porra, 2017). Several standards may be involved, individually or simultaneously, in such an evaluation (Baker & Crompton, 2000; Boulding et al., 1993; Zeithaml et al., 1993). Consumers' standards or expectations are usually based on two factors: what they want to find and what they think the business can provide. The firm's image, the consumers' personal needs, friends' feedback, ads, and the consumers' previous experience are important factors in shaping these perceptions (Maestro et al., 2007). In the context of services, perceived quality is often conceptualised as a multidimensional term. The consumer evaluates the service's quality using various dimensions performed to how it is delivered. According to Saleem et al. (2015), the

customer perception of a product after usage is known as purchase intentions. As a result of these findings, this study suggests perceived quality have a tangible link with purchase intention. Thus, H2: There is a significant relationship between perceived quality and purchase intention.

2.6.3 Trust and Purchase Intentions

Ert et al. (2016) stated that trust is among the most significant aspects of conducting an online transaction. When customers have a higher level of trust in an online retailer, they are more likely to purchase online (Lim & Cham, 2015). Ert et al. (2016) further stated that guests on Airbnb use listing information such as high positive online reviews to make an online booking decision. Chen and Chang (2018) noted that a free-form text comment through which the customers describe their experience with and or perception of the service used served as a valuable reference for potential future customers. According to Lee and Shin (2014), such reviews significantly influence consumer purchase intention. Apart from that, information on the host also plays a role when making an online booking. Online seller profile photos are some of the elements that influence customer's trust when making an online purchase. The human face is one of the most visible sources of social information (Yacouel & Fleischer, 2012). Based on the literature, the hypothesis that can be derived is that trust has a significant relationship with purchase intention. Thus, H3: There is a significant relationship between trust and purchase intention.

2.6.4 Perceived Risks and Purchase Intentions

Tourists may choose not to rent an Airbnb due to the risks it may pose to the tourist. Studies by Kotler and Kotler (2018) and Loh (2021) indicates that perceived risk are factors including finance, functionality, physical and psychological risks. Airbnb bookings made on the Airbnb website or application in an online environment provide access and offer different experiences than other accommodation booking options. Therefore, consumers may interpret their experience differently as travel and tourism experiences tend to be very subjective (Loh, 2021). Furthermore, this variability would include the risks that may affect the tourists' experience before, during and after their stay. Thus, this suggests that perceived risks have a significant relationship with the purchase intention of young Malaysian travellers in booking Airbnb online. Therefore, H4: There is a significant relationship between perceived risks and purchase intention.

3. METHODOLOGY

A quantitative approach through a cross-sectional study was chosen for this study. A survey that consists of online questions was formed to obtain data from travellers. The survey questionnaires presented through a Google Form link were distributed via online social media platforms and applications such as WhatsApp, Facebook, Instagram, and LinkedIn as it is less time consuming for researchers. The online data collection methods are more suited for young travellers as they are heavily inclined to use technological mediums in their daily lives (Back, 2019). The distribution of questionnaires was completed in a week.

The questionnaire's items are derived from several past studies. The independent variables contain four factors: perceived price, quality, trust, and perceived risk. A total of 20 items were used for independents variables containing five items for each factor. The items were adapted from those used by various researchers such as Banjarnahor (2017), Chang (2008), Chiang (2014), Fsang (2014), Küçükergin (2014), Lien (2015), Oosthuizen (2015), and Wang (2015)

studies. Five items for purchase intention were adapted from Banjarnahor (2017) and Lien (2015). A five-point Likert scale was used.

Young traveller's aged between 15 to 40 years old (Azhar et al., 2020) were chosen because the study focused on young travellers. According to the World Tourism Organization (UNWTO), young people accounted for approximately 20% of all international tourist arrivals in 2010. There are 28.25 million young travellers in Malaysia (Malaysia Department of Statistics, 2010). Survey questionnaires were distributed through online mediums. The collected data were examined using the Statistical Package for Social Sciences (SPSS) software, where descriptive and regression were used to analyse the relationship between the variables.

4. DATA ANALYSIS AND RESULT

4.1 Descriptive Analysis

Based on Table 1, the respondents were segregated by gender; male respondents made up the majority of the responses collected (53.5%). Female respondents, on the other hand, recorded 46.5% of responses. In terms of the age grouping of the respondents, the age group that had the highest percentage of responses were from the 21 - 25 years old category with 69.8%.

Table 1. Demographic of Respondents

Descriptions	Frequency	Percentage (%)
Gender		
Male	69	53.5
Female	60	46.5
Age (years old)		
18 - 20	14	10.9
21 - 25	90	69.8
26 - 30	25	19.4
Education Level		
High School	19	14.7
Undergraduate (Diploma & Degree)	87	67.4
Postgraduate (Master & PhD)	23	17.8
Profession		
Government Sector	7	5.4
Private Sector	54	41.9
Business Owner	13	10.1
Student	51	39.5
Other	4	3.1
What is your priority when choosing accommodation?		
Cheap price	62	48.1
Location	18	14.0
Facilities and amenities	47	36.4
Size of accommodation	2	1.6
How much would you spend on accommodation? (RM)		
0-100	24	18.6
101-200	64	49.6
201-300	35	27.1
301-400	6	4.7

The second lowest came from the 26 - 30 years old category with 19.4% of the responses, whilst the lowest came from the 18 - 20 years old category with 10.9% of the responses. For the level of education, most of the respondents were undergraduate students, who accounted for 67.4% of responses. The second-highest percentage for responses was from postgraduate students with 17.8%, whilst high school students had the lowest percentage of respondents with 14.7%. The

profession of the respondents indicated a high percentage of staff in the private sector answered the questionnaire with a percentage of response at 41.9%, followed by students at 39.5%, business owners at 10.1%, government sector workers at 5.4% and others at 3.1%. Cheap price (48.1%) was the priority for young travellers in choosing accommodation. While accommodation category range of between RM101-200 was their highest preferred amount of money spent for accommodation stay (49.6%).

4.2 Regression Analysis

Testing of the reliability of instruments was conducted, and the Cronbach alpha value for all factors was above 0.700 ranges from 0.959 for perceived risk, 0.962 for perceived quality, 0.964 for a perceived price, and 0.966 for trust, indicating good validity and reliability. Table 2 shows the model summary that informs Perceived Price, Perceived Quality, Trust and Perceived Risk influence young travellers by 73.4% (Adjusted $R^2 = 0.734$) of the variance on the Purchase Intention, and other variables explain the remaining 26.6%.

Table 2. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.857	0.734	0.725	0.36339

a. Predictors: (Constant), Perceived Price, Perceived Quality, Trust, Perceived Risk

Table 3. The Coefficient for Perceived Price, Perceived Quality, Trust and Perceived Risk

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.706	.213		3.311	.001
	Perceived Price	.147	.089	.148	1.643	.103
	Perceived Quality	.260	.098	.252	2.637	.009
	Trust	.404	.096	.423	4.207	.000
	Perceived Risk	.077	.065	.095	1.185	.238

a. Dependent Variable: Factors on Purchase Intentions

The regression results also found that only perceived quality and trust significantly correlated with purchase intentions ($p<0.05$). Therefore, the hypothesis for H2 and H3 are supported. Perceived price and perceived risks were found to be not significant. Hence, the hypothesis for both H1 and H4 were not supported. Results from this study also show that trust is the most critical factor in influencing the purchase intention among young travellers in Malaysia ($\beta = 0.423$), followed by Perceived Quality ($\beta = 0.252$) and Perceived Price ($\beta = 0.148$). Meanwhile, the lowest value is Perceived risk *($\beta = 0.095$)*.

5. DISCUSSION

The prices of products would influence consumer's purchase intention following various past research (Dalee, 2015). Results of this study, however, showed that perceived price is not

significant towards purchase intentions. Although price is vital in influencing a consumer's decision and purchasing behaviour (Chiang, 2014), some tourists claim that the product's price may not reflect the expected services (Feng, 2018). Some tourists would prefer to choose accommodations that they deem worthy of their trust and expectation of quality rather than the price. Malaysian young travellers have shown to have high expectations (Glover, 2010) on quality and value for money, where they can hinder accommodations from expensive accommodation options due to their limited budget and constraints (Jang et al., 2004). Young traveller's expectations and value for money make them continuously search for prices that suit their level of finance that corresponds to their expected travel experiences due to their high value and technology savviness (Chiang, 2014; Back, 2018).

The result of this study shows significant relationships between perceived quality and purchase intentions. The study is consistent with Keller (2008) and Mirabi (2015) studies where young travellers purchase intentions would be influenced by their perceptions of the general quality of the product they intend to purchase. It is understood that the young travellers would look at the quality of Airbnb before making their bookings through finding reviews on social media (Back, 2018) or the Airbnb application or website and even other review websites. Typically, when a product or service has a high rating, that would mean that the quality of the product or service is of top-notch quality and would positively influence purchase intention and even repeat purchases (Feng, 2018). This provides a positive level of perceived quality and superiority to other products (Porra, 2017). Furthermore, the perceived quality often overtakes the perceived price to some extent, as recorded in previous studies (Abidin, 2015), as typically, consumers would expect a more valuable service (Chiang, 2014). Young Travelers have high expectations for the products they purchase despite their financial constraints (Jang et al., 2004; Glover, 2010).

The trust factor influences young travellers' purchase intention in booking Airbnb online, indicating a significant relationship between the two variables. Trust, being a state of showing intention to accept vulnerabilities based on positive expectations of intentions of behaviour (Rousseau et al., 1998), is one the most crucial aspects of the customer-seller relationship, especially within the context of the online transaction (Lim et al., 2019). The result aligns with Lim and Cham, 2015; Liang et al., 2018; and Feng, 2018. With a high level of trust, consumers are more likely to purchase a product or service online, thus making the transaction occurrence more likely to happen. Airbnb deals with sensitive information as the transactions would be done online and need the consumer to provide private and sensitive details. With a well-known background for their technical prowess (Back, 2018), young travellers use their competence in using technology and social media to search extensively for information to trust Airbnb.

The relationship between perceived risks and purchase intentions in this study were found not significant. Previous studies have shown that when a product or service has a certain level of perceived risk, it often equates to negative behaviour (reluctance and hindrance) toward the product or service (Wang et al., 2019). Thus, this leads to a need for information searching done by young travellers, such as via the Airbnb mobile application or website (Feng, 2018). Young travellers may search for information extensively (Back, 2018). They are more likely to be curious and adventurous, meaning they would look for novelty experiences and are more willing to take risks than other age demographics for the best travel experience possible (ITB Berlin, 2017).

Moreover, experiences are also subjective to the respective user. This variability will include the risks listed by authors Loh et al. (2021). These risks could influence the tourists' experience before, during, and after their stay. However, their need for adventure can overcome their levels

of perceived risk as long as their expectations (Glover, 2010) for adventure and novelty experiences are met. It further justifies that perceived risk does not have a significant relationship with the purchase intention of young travellers in booking Airbnb online.

6. CONCLUSION

In conclusion, this research examined the factors influencing young travellers' purchase intentions in booking Airbnb online. This research found that the perceived price, quality, trust, and risk influenced young travellers' purchase intentions in booking Airbnb online. It also found that trust is the factor that influences young travellers' purchase intentions the most. Although young travellers are considered risk-takers and a curious and adventurous market, they would ensure that the transactions they make are done with trusted parties such as Airbnb (Liang et al., 2018). Young travellers utilised their technological prowess (Back, 2018) to search for trusted parties to purchase their accommodations. The findings of this study would be beneficial to various stakeholders for future research and developmental plans. From a practical perspective, this study will significantly contribute knowledge to the online travel agents and operators for them to better understand Malaysian young adults' purchase intentions towards online booking and boost its local target market by improving its travel products and packages. Future studies may consider using qualitative methods or mixed methods to gain deeper insights into the young travellers' booking intention on Airbnb. Furthermore, young travellers' booking intentions in the home-sharing sector in comparison with other countries such as Singapore and Thailand can be considered to understand their intentions better.

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APPENDIX

Appendix 1: Survey Instrument

Variable	Code	Item	Source
Perceived Price	PP1	The price listed by Airbnb is affordable.	
	PP2	The prices shown fit with the services provided by Airbnb.	
	PP3	Airbnb is generally in the affordable price range.	
	PP4	I am conscious when booking an Airbnb.	
	PP5	The price of Airbnb is a good indicator of quality.	
Perceived Quality	PQ1	The overall quality of the Airbnb I have booked is good.	
	PQ2	The Airbnb reservation information is good.	
	PQ3	The Airbnb facilities information is good.	
	PQ4	The Privacy policy displayed on personal guest data is good.	
	PQ5	Information provided on the secured online payment system is good.	
Trust	T1	The Airbnb website/app have the necessary abilities to handle sales transactions on the internet.	
	T2	The Airbnb website/app have sufficient expertise to do business on the internet.	
	T3	The Airbnb website/app provide information in an honest way.	
	T4	I am confident about promises made by the Airbnb website/app.	
	T5	All in all, I trust the Airbnb website/app.	
Perceived Risk	PR1	I feel like there is no financial risk when I book the Airbnb.	
	PR2	I feel that there is no functional risk when I book the Airbnb.	
	PR3	I feel that there is no psychological risk when I book the Airbnb.	
	PR4	I feel that there is no physical risk when I book the Airbnb.	
	PR5	I feel that there is no social risk when I book the Airbnb.	
Purchase Intention	PI1	After reviewing the Airbnb website/app, the likelihood of booking a room is high.	
	PI2	I would book a stay using the Airbnb website/app.	
	PI3	I would book the Airbnb if the price suits my preferred price range.	
	PI4	I would recommend the Airbnb website/app to my peers.	
	PI5	I would not hesitate to provide information on the Airbnb website/app.	

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Investigating the Attributes of Chinese Primary School Adoption among the Malay Community in Malaysia

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ABSTRACT

Around 100,000 non-Chinese students are studying in Sekolah Jenis Kebangsaan Cina (SJKC) schools every year in Malaysia. Most of them are Malays and Bumiputeras. Although there is some research on non-Chinese students in SJKCs, no research has taken place in Selangor. This study aims to investigate why Malay parents sent their children to SJKC and their expectations for their children's education in SJKC. This study also explored the academic achievement patterns and factors that affected students' learning outcomes. A total of 113 Malay students and 111 teachers from 5 selected SJKCs in Klang, Selangor, participated in this study. The data collection method used in this study included surveys, interviews, and content analysis. Descriptive statistics and qualitative approaches were used to analyse the data collected. The reason Malay parents in Klang sent their children to SJKC was more inclined to instrumental motivational factors. Malay parents wanted their children to master the Chinese language because of its high economic value, leading to better prospects in the future. The overall academic achievement of the Malay students in this study is less satisfactory. Lastly, the factors affecting students' Chinese language acquisition included students' academic ability, attitude and motivation. The external factors are the family's lack of a Chinese language environment, parents having low expectations, and a lack of spiritual and material support. The findings of this research will help Malay parents and teachers in SJKCs to have a better understanding of the learning situation of Malay students in SJKCs in Klang. Malay parents should give more attention and support their children's learning process in SJKCs, as early as possible.

1. INTRODUCTION

The interest by non-Chinese students to study in Chinese national-type primary school or Sekolah Jenis Kebangsaan Cina (SJKC) seems to be on an increasing trend. According to the report by the Ministry of Education, the number of non-Chinese students in SJKCs increased from 11.84% in 2010 to 19.75% in 2020. The current Minister of Education, Mohd Radzi Md Jidin, mentioned that the number of Chinese students studying in SJKC decreased from 88.16% in 2010 to 80.25% in 2020. The Minister also pointed out that in 2020, the breakdown of the SJKC's non-Chinese student proportion is as follows: Malay 15.33%, Indian 2.75%, and other races 1.67%, in total 19.75% (New Strait Times, 11 Nov 2020). Table 1 shows the statistics of non-Chinese students in all SJKCs in Malaysia from 1989 to 2020, while Figure 1 shows the trend of the numbers of non-Chinese students in SJKCs.

Table 1. Statistics of Non-Chinese Students in SJKC

Year	Total Number of Students	Number of Non-Chinese Students	Percent (%)
1989	567,803	17,309	3.1
1994	583,825	32,203	5.5
1998	601,155	52,043	8.7
1999	609,673	65,000	10.7
2010	603,192	71,418	11.8
2014	559,157	87,463	15.3
2016	540,290	97,252	18.0
2020	509,589	100,644	19.75

Source: The Ministry of Education, Malaysia; Jiao Zong, 2018; Enanyang, 2020; New Strait Times, 2020.
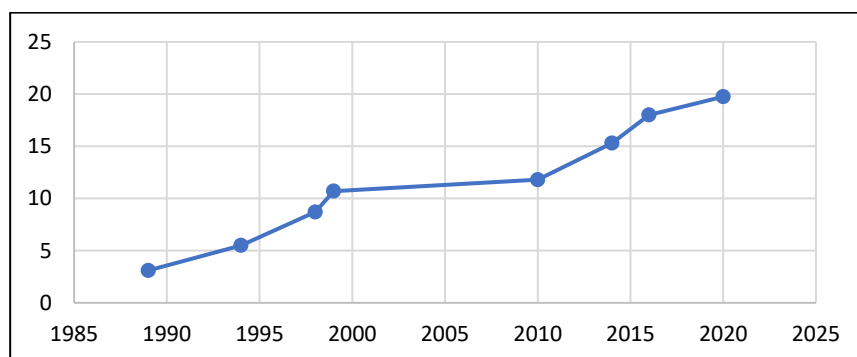

Figure 1. Trend of Non-Chinese Students Enrolment in SJKCs from 1989 - 2020

Figure 2 shows the comparison between the total number of students and the number of non-Chinese students in SJKCs from 2009 to 2020. Figure 2 shows that non-Chinese students have increased while the total number has decreased since 2014. The total number of students in SJKCs have dropped from 603,192 in 2010 to 559,157 in 2014, then to 509,589 in 2020 (see Table 1). According to the 2018 report by the Chinese School Teachers' Association of Malaysia (Jiao Zong), the decreasing trend of the total number of students is due to the decreasing birth rate of the Chinese population in Malaysia. Besides, many Chinese parents sent their children to private and international schools, which provided better English education. In this case, an unusual phenomenon has occurred whereby the total number of students in SJKCs has decreased, but there is a drastic increase in the number of non-Chinese students. There are a few possibilities of why this could be happening. The first possibility could be the rise of China's economy, which prompted the parents to send their children to SJKCs to learn

the Chinese language. The second possibility could be that the quality of education in SJKCs is attractive to Malay parents. The third possibility could be because there are geographical advantages of the SJKCs. This study aims to study the Malay parents' intention to send their children to SJKCs in Klang, Selangor.
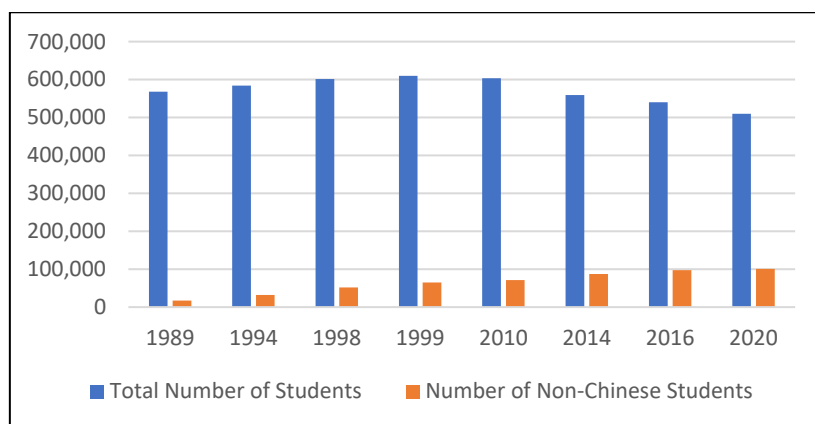

Figure 2. Comparison between Total Students and Non-Chinese Students in SJKCs

There is a need for research on the learning situation of non-Chinese students in SJKCs. As shown in Table 1, in 2020, over 100,000 non-Chinese students are studying in SJKCs all over Malaysia, and most of them are Malays and Bumiputeras (indigenous people). To date, there has been minimal research done on the learning situation of non-Chinese students in SJKC. One of the earliest relevant research was by Heng and Neo (2005), in which they researched the learning situation of the Malay students in 7 SJKCs in Kelantan. Neo and Heng investigated the intention of the Malay parents in sending their children to study in SJKC. Through their findings, they have identified problems faced in the children's learning process. Ten years later, Tan (2015) did similar research on 14 SJKCs in Kelantan. Other researchers had conducted other research topics on non-Chinese or Malay students in SJKCs in various states in Malaysia. Some of them also looked into the intentions and reasons of Malay parents sending their children to study in SJKC, and these included three relevant research in Johor (Asmahani, 2009; Tay, 2006; Yahaya & Abd Hamid, 2003), and three in Perak, Pahang and Negeri Sembilan (Zeng, 2017; Lin, 2009; Tan, Ngu & Chew, 2017). On the other hand, Zaki (2017) and Muhammad Fikri (2017) researched the religious studies of the SJKC Malay students in Johor Bahru, Johor. Marimun and Ahmad (2019) examined the history subject of Malay students. Researches were also done in East Malaysia, Sarawak (Tay 2012; Ngien & Ching, 2016) and Sabah (Cui, 2011; Bi, 2019).

Numerous researches were conducted on non-Chinese students in SJKCs, but no such research has taken place in Selangor. Therefore, the researchers have decided to focus on Klang's selected SJKCs with many Malay students for this study. The main purposes of this study are: (1) to identify the intentions of the Malay parents sending their children to Klang's SJKC; (2) to study the Chinese language performance of Malay students in Klang's SJKC; (3) to study the factors that affect the learning of Chinese language among Malay students in Klang's SJKC. It is hoped that the findings of this research will benefit the public significantly to help Malay parents and teachers in SJKCs to have a better understanding of the learning situation of Malay students in Klang's SJKC. This study provided some suggestions to parents, teachers and schools on improving Malay students' learning.

2. LITERATURE REVIEW

This section mainly discusses past research on why non-Chinese parents send their children to SJKCs and the learning progress of non-Chinese students in SJKCs. Past studies have found that the primary purpose of non-Chinese parents sending their children to SJKCs is to allow them to master three languages. In addition to Malay and English, these parents want their children to learn Chinese well (Heng & Neo, 2005; Tan, 2015; Tan et al., 2017; Yahaya et al., 2003; Zeng, 2017). A study by Heng and Neo (2005) reported that Malay parents sent their children to SJKCs to master three languages or acquire the Chinese language. Still, they were also motivated by other factors, notably the education quality of SJKCs. These parents believed that in SJKC, the discipline is better, teachers are more diligent, it is easier to cultivate children's learning attitude, the mathematics education quality is relatively high. The academic competition atmosphere is relatively strong. Other minor considerations included meeting parents' wishes, wanting to learn more about Chinese culture and traditions, and having family members of Chinese descent. Tan (2015) also conducted a similar survey on 300 Malay parents in 14 SJKCs in Kelantan to determine the factors for sending their children to SJKCs. The survey showed the main reason was for their children's future and personality shaping. Indeed, the quality of education, administration and learning environment were also among the main attractions. Parents expected their children to have a better future by getting educated in Chinese schools. In addition, Zeng (2017) also reported about non-Chinese students attending Chinese primary schools in SJKC Ping Min Pundut, Lumut. The study found that parents favour Chinese primary schools because they were aware of the importance of Chinese and wanted their children to master a different language to enhance their competitiveness in future.

Based on the above studies, it was found that non-Chinese and Malay parents sent their children to SJKCs to receive Chinese education mainly due to the economic value of the Chinese language. Parents realised that the economic value of the Chinese language is getting higher. They hoped their children would master this language to strengthen their competitiveness in the workplace, have more job offers and better prospects in the future. Of course, non-Chinese parents also sent their children to SJKCs for SJKCs' quality of education. In addition to exploring why non-Chinese parents send their children to SJKCs, there are also a lot of papers on Chinese language acquisition among non-Chinese students in SJKCs in Malaysia. Heng and Neo (2005) found that Malay students faced fewer difficulties in listening and speaking the Chinese language but encountered problems identifying and writing Chinese characters after regurgitation from memory. Therefore, they did not perform well in writing and understanding Chinese; and they also experienced some difficulties in reading Chinese. Thus, their results in Chinese writing and reading were slightly weaker compared to listening and speaking.

In a study by Tay (2012), it was found that the learning outcome was less effective if the first language teaching method was used with non-Chinese students. Tay's research focused on the Chinese language teaching and acquisition of non-Chinese students in SJKCs in Sarawak. The study also found that Chinese language acquisition was abnormal among non-Chinese students. None of the teachers surveyed was satisfied with the results of non-Chinese students in the Chinese language. They believed that non-Chinese students did not perform as well as Chinese students as 45% of the students surveyed failed their Chinese language with a score of fewer than 39 marks. Tay believes that SJKC is not an ideal learning environment for non-Chinese students to master the Chinese language. On the other hand, Bi (2019) studied the academic performance of non-Chinese students in SJKC Yuk Yin, Sabah. The research focused on analysing the influences of teachers' teaching mode, teaching materials used, teachers' teaching concept and family environment on the academic performance of non-Chinese students in SJKC Yuk Yin, Sabah. The study found that the academic performance of non-Chinese students in

SJKC Yuk Yin differed significantly from Chinese students. Non-Chinese students were lowly motivated and had difficulty in maintaining learning motivation. The study also found that factors such as shortage of teachers, improper teaching patterns, and the external environment of the language were not conducive for learning. They had significant impacts on the academic performance of non-Chinese students. The external environment factor of not being conducive to learning the language included non-Chinese students having limited exposure to the Chinese language due to environmental factors, non-Chinese parents having lower expectations on their children's achievement in the Chinese language, and non-Chinese parents not understanding Chinese. Therefore, they found it difficult to help with their children's homework. Thus, non-Chinese students' exposure to the Chinese language was limited to only school learning time. There were many non-Chinese students in SJKC Yuk Yin, much more than the number of Chinese students. Bi believed that this environment is not conducive for non-Chinese students to master the Chinese language.

Based on the above studies, it can be concluded that most non-Chinese students do not perform well in Chinese (Bi, 2019; Heng & Neo, 2005; Ngien & Ching, 2016; Tan, 2015; Tay, 2012; Zeng, 2017). Some of the significant factors that affect children's learning outcomes are teachers' teaching methods (Bi, 2019; Tay, 2012), language environment at home, and parents' expectations and support (Bi, 2019; Heng & Neo, 2005; Tan, 2015).

3. METHOD

Five SJKCs in Klang, Selangor, were selected as samples of this study. The five SJKCs included small, medium, and large-sized schools with general to excellent academic achievements. However, these schools were chosen because the number of Malay students in these five SJKCs is relatively large compared to other SJKCs. Teachers, Malay students and their parents from these 5 SJKCs were selected as participants of this study. These five SJKCs were labelled as School A, School B, School C, School D and School E. A total of 111 teachers, 113 Malay students and their parents participated in this research. For this study, students selected were from upper-primary classes. They were Year 4 and Year 5 students (Year 6 students who had to prepare for UPSR were not allowed to participate in this survey). There were two reasons for choosing Year 4 and Year 5 students as the samples of this study. Firstly, it would be more difficult for lower-primary students to answer the questionnaire accurately because some of the contexts in the questionnaire were beyond their ability to understand. Secondly, upper-primary students have been studying in the school for some time, and thus their parents and teachers would have a better understanding of their learning situation in school. Therefore, the study would obtain more reliable and objective information.

The data collection method used in this study are mainly surveys, interviews, and content analysis. The researchers conducted a questionnaire survey on teachers, students and their parents. The questionnaire constructed for students and parents consisted of three parts. The first part was to investigate their family background and the second part was to examine the parents' intention of sending their children to SJKCs. Parents answered both parts of the questionnaire. In contrast, the third part investigated the problems faced by Malay students when studying in SJKCs. A specific form was prepared to collect and analyse the students' academic performance based on the students' performance reports provided by each school. The objective was to explore the features of their learning achievement. Students' questionnaires were administered face-to-face at the selected schools. Although the researchers assumed that the upper-primary students could answer the questionnaire by themselves, the researchers were there for any enquiry to ensure the accuracy and reliability of the responses to the questionnaire. The first and second parts of the questionnaire, which were the parents'

background and their intention on sending their children to SJKC, were taken home by students to be answered by their parents. The answered questionnaire was returned to the teacher in charge the next day and collected by the researchers.

The teachers' questionnaire (in a Google Form) was sent to teachers via WhatsApp groups. The questionnaire contained 17 questions, mainly to collect teachers' views on the Malay students' Chinese language acquisition and gather their teaching experience. The survey data were analysed by using the SPSS 21.0 statistical programme. Descriptive statistics in terms of frequency counts and percentages were used to obtain patterns of occurrences. Interviews were also conducted to get insight into factors that affected student learning and for triangulation purposes. Interview sessions were conducted with 2-3 Chinese language teachers from each school. All interviews were recorded and transcribed for analysis. The content analysis method was used to analyse students' academic performance based on the reports provided by each school. The Chinese language performance is discussed under Research Question 2. The following data analysis is a combination of data from surveys, report analysis, and interviews.

4. DATA ANALYSIS AND DISCUSSION

A total of 144 student questionnaires were sent out in this study, and 133 were returned. After removing the incomplete ones, only 113 completed questionnaires were left for analysis. Table 2 shows the profile of the student participants. Table 2 shows the student participants' profiles. Of the 113 students from five different SJKCs in Klang, 53 (46.9%) were year 4 students, and 60 (53.1%) were year 5 students.

Table 2. Profile of Participants

Name of SJKC	Year 4	Year 5	Total
School A	8	8	16
School B	16	14	30
School C	11	16	27
School D	12	9	21
School E	6	13	19
Total	53	60	113
Percentage	(46.9%)	(53.1%)	(100.0%)

The background information of the students' parents, such as education level, occupation and household income, show the socio-economic status of these groups of parents. In total, 47.7% of the parents are college-educated, while 52.3% of the parents are primary and secondary school educated. In terms of occupation, only 18.3% are professionals, 30.4% semi-professionals, 10.7% non-professionals, 21.8% self-employed and 18.8% unemployed. In terms of household income, since this study began its fieldwork in early 2019, the household income category was following those established by the government in 2016. Those with a monthly household income of less than RM3,000 are categorized as B40; those with a monthly household income of between RM 3,001 – RM 13,148 as M40; and those with a monthly household income of RM 13,148 or more as T20. According to this classification, 46.8% of the Malay students are from the B40 group, and 44.2% are from the M40 group. Only 9.0% of the students are from the T20 high household income group. Based on these findings, it can be concluded that the majority of the Malay students in this study are from middle and lower-class families. What are the intentions of these Malay parents sending their children to study in SJKCs? What do they expect their children to gain through Chinese education? Does the children's performance meet the parents' expectations? The following report will answer these questions.

4.1 Why do Malay Parents Send Their Children to SJKCs in Klang?

This section discusses Malay parents' intention to send their children to SJKCs based on the survey data from students and parents. Table 3 shows that the primary purpose of Malay parents sending their children to SJKC was for their children to master three languages, namely Malay, English and Chinese (M=4.62, S.D.=0.60). Other than Malay and English, parents wished their children would be able to read and write Chinese characters (M=4.49, S.D.=0.64) and also communicate in Mandarin (M=4.44, S.D.=0.65) because they believed that the Chinese language's economic value was increasing (M=4.03, S.D.=0.79). Parents thought that when their children could listen, speak, read and write in Chinese, they would have better employment opportunities in the future (M=4.4, S.D.=0.79). Perhaps many Malay parents were well aware that the communication between people and countries was becoming more frequent. They understood that being multilingual and multicultural was vital, making them more competitive and more adaptive in the future. Therefore, some far-sighted Malay parents sent their children to study in SJKCs instead of the National Schools (SK), which lacked a trilingual learning environment.

Table 3. Economic Value of Chinese Language

	Reasons	Mean (M)	S.D.	N
1.	Able to master 3 languages (Chinese, Malay, English)	4.62	0.60	112
2.	Able to read and write Chinese characters	4.49	0.64	113
3.	Able to communicate in Mandarin	4.44	0.65	113
4.	Better employment opportunities in the future	4.4	0.79	113
5.	Chinese language's economic value is increasing	4.03	0.79	113

Malay parents agreed that the education system in SJKC is better (M=4.11, S.D.=0.77). These parents believed that some good qualities attracted them to SJKC. They believed that the discipline among SJKC students was better (M=4.25, S.D.=0.75), administrative management was more systematic (M=4.0, S.D.=0.75), facilities were more up-to-date and complete (M=3.96, S.D.=0.68), student performance evaluation was more organized (M=3.87, S.D.=0.70). There was more emphasis on academics (M=3.72, S.D.=0.93). Students' homework was also more emphasized (M=3.79, S.D.=0.89). Parents also believed that the quality of education in SJKC is higher (M=3.63, S.D.=0.87), and students can obtain a better education in Science and Mathematics subjects (M=3.72, S.D.=0.73). Other than the excellent education qualities in SJKC, the teachers' quality had also attracted Malay parents to send their children to SJKC. SJKC teachers were more serious and diligent in their work (M=3.94, S.D.=0.75). Parents also believed that SJKC teachers are more professional and have better quality (M=3.7, S.D.=0.77). These are all the factors that prompted them to send their children to study at SJKCs.

Besides being attracted by SJKC's education system, the data shows that this group of Malay parents who sent their children to SJKC were relatively open-minded and more able to accept other ethnicities, languages and cultures. They hoped their children could interact with multi-ethnic friends in SJKCs (M=4.42, S.D.=0.51), and they also hoped their children could learn more about Chinese culture and traditions (M=3.65, S.D.=0.86). This intention is very encouraging. We believe that these students who completed six years of education in SJKCs will be more open-minded when they grow up. This will undoubtedly have a positive impact on our multicultural integration and multi-ethnic unity in Malaysia.

In addition, the other important factor that prompted Malay parents to send their children to study in SJKC is the geographical factor. Klang is an area with a higher density of Chinese population and therefore has more SJKCs. Some Malay parents sent their children to SJKC because of convenience and proximity to their home (M=3.80, S.D.=1.09). Thus, the geographical factor is also a reason for Malay parents to send their children to SJKCs. Finally, three other factors identified were not as significant. These include the following: (i) "I follow what the trend does", the so-called "The Flock Effect" (M=3.14, S.D.=1.03); (ii) The blood relationship: Chinese descent (M=3.03, S.D.=1.43); (iii) Easier to obtain the benefits and help that is provided by the Parents-Teachers Association (M=2.97, S.D.=0.91).

Based on Gardner's (1985) Motivation Theory, Malay parents' motivation to want their children to learn Chinese tends to be instrumental motivation. Parents want their children to master the Chinese language because their children will have better employment opportunities and better prospects in the future. This finding is consistent with findings of Heng and Neo (2005), Tan (2015), Yahaya et al. (2003), and Zeng (2017). On top of that, with the quality of education that SJKCs offered, parents hoped to cultivate well-disciplined, academic, and competitive children. These could also be categorised as instrumental motivation. Parents' integrated motivation though it exists, is weaker. Letting their children "socialise with multi-ethnic friends" in SJKC; wanting "to understand and learn more about Chinese culture and social traditions"; having "Chinese descent," and hoping "to blend into the Chinese society by learning the Chinese language" are the integrated motivation of parents.

4.2 The Chinese Language Performance of Malay students in SJKC

The ability to perform the four language skills of Chinese, listening, speaking, reading, and writing, were analysed. Table 4 shows the students' results for Chinese Writing. This group of students had good Chinese writing skills in Year 1 as 17.9% of students achieved grade A, 33.3% achieved grade B, and only 7.1% had not mastered or failed (grade E). In Year 2, students' performance began to decline. From this year onwards to Year 5, none of them had obtained grade A for Chinese Writing, while the number of students who achieved grade B lessened. In addition, the number of failures has also increased through the years. This shows that Malay students' Chinese writing skills have been below the required standard since Year 2. The reason students were able to get a good result in Year 1 was that they had a basic knowledge of the Chinese language due to the two years of Chinese education in kindergarten, which is sufficient as preparation for Year 1. However, as they progressed, the content and skill requirements for Chinese Writing had also increased. As a result, the Malay students underperformed. In Year 3, 56% of students failed in Chinese Writing, and the figure rose to 76.5% in Year 4 and 77.6% in Year 5. This shows an entirely unsatisfactory performance.

Table 4. Chinese Writing

Grade	Year 1 F (%)	Year 2 F (%)	Year 3 F (%)	Year 4 F (%)	Year 5 F (%)	Total F (%)
A	15 (17.9)	0	0	0	0	15 (3.6)
B	28 (33.3)	6 (6.9)	6 (6.6)	2 (2.0)	0	42 (10.1)
C	25 (29.8)	14 (16.1)	18 (19.8)	7 (7.2)	6 (10.3)	70 (16.7)
D	10 (11.9)	20 (23.0)	16 (17.6)	14 (14.3)	7 (12.1)	67 (16.0)
E	6 (7.1)	47 (54.0)	51 (56.0)	75 (76.5)	45 (77.6)	224 (53.6)
Total	84 (100.0)	87 (100)	91 (100)	98 (100)	58 (100)	418 (100)

The result for Chinese Reading Comprehension is slightly better compared to Chinese Writing (see Table 5). Besides Year 1, some students achieved grades A and B in Year 2 and 3. But the number of students with grades A and B declined from year to year. This finding was similar for Chinese Writing. The high failure rate in the upper-primary level was worrying. The failure rate in Year 4 was 81.6% and 74.1% in Year 5. The result in Chinese Writing and the result in Chinese Reading Comprehension was about the same. Both subjects presented the same trend in the results, which is, students were able to master Chinese Writing and Reading Comprehension in Year 1 but performed poorly as they progressed to higher levels. This situation can be seen in Figure 3.

Table 5. Chinese Reading Comprehension

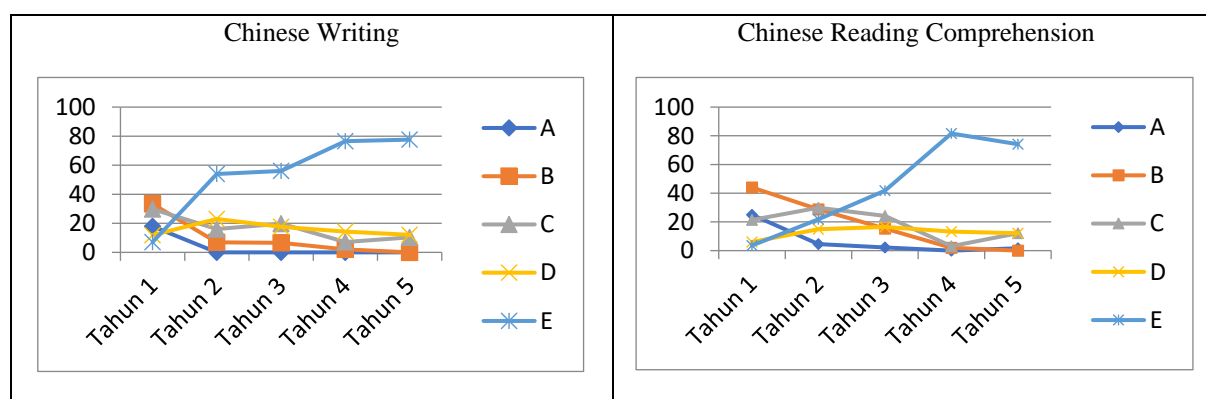| Grade	Year 1 F (%)	Year 2 F (%)	Year 3 F (%)	Year 4 F (%)	Year 5 F (%)	Total F (%)
A	21 (25.0)	4 (4.6)	2 (2.2)	0	1 (1.7)	28(6.7)
B	37 (44.0)	25 (28.7)	14 (15.4)	2 (2.0)	0	78(18.6)
C	18 (21.4)	26 (29.9)	22 (24.2)	3 (3.1)	7 (12.1)	76(18.2)
D	5 (6.0)	13 (14.9)	15 (16.5)	13 (13.3)	7 (12.1)	53(12.7)
E	3 (3.6)	19 (21.8)	38 (41.8)	80 (81.6)	43 (74.1)	183(43.8)
Total	84 (100)	87 (100)	91 (100)	98 (100)	58 (100)	418(100)

Figure 3. Students' Chinese Writing and Reading Comprehension Performance

Some of the results for Chinese Speaking and Reading were not provided by the schools. Therefore, the analysis is only based on the information obtained. The evaluation for Chinese Speaking and Reading proficiency was relatively simple, and they only evaluated the skills by assigning "mastered" and "not mastered". The overall performance of students' speaking skills was good. More than 87% of Year 1 to Year 4 students had mastered the speaking skill. For Year 5, 80% of them mastered speaking, and only 20% of the students failed to do so. The Chinese Reading results are less satisfactory than Chinese Speaking as 83% of the students had mastered Chinese Reading in Year 1, 73% of them in Year 2, 65% of them in Year 3, 69% in Year 4, and 35.4% in Year 5. The results of these two skills presented a similar trend, whereby the results declined as the students progressed to higher levels.

Data in the tables and figures above showed that Malay students faced many problems mastering the Chinese language. In the four Chinese language skills tests, students are less likely to face difficulties with listening and speaking skills. They can listen to and speak Chinese fluently. Although the students' achievements show a declining trend as they move into upper primary, it is acceptable as the passing rate is more than 80%. As for Chinese reading skills, there was an upward trend initially, but there was a sharp drop in Year 5, with a failure rate of

65%. The data show that these students are weakest in Chinese Reading Comprehension and Chinese Writing. We can see that their overall performance is on a downward trend compared to their age, and the failure rate remained high through the years. Predictably, Malay students perform differently in Chinese listening, speaking, reading and writing skills because reading comprehension and writing skills are inherently higher-order language skills. Even among the Chinese society, some people could understand and speak Chinese but could not read nor write Chinese.

In general, Malay students from SJKCs in Klang underperformed in the Chinese language. There is still a lot of room for improvement. The data from the survey were consistent with the data from the interview. Most of the interviewed teachers pointed out that Malay students in SJKCs usually perform below satisfactory grades. There are very few students with good grades, but most of them fall into middle and lower grades. The findings of this study on the Chinese language proficiency of Malay students from SJKC in Klang are similar to those found by Heng and Neo (2005). Heng and Neo found that Malay students from SJKC in Kelantan encountered many Chinese language challenges. Among the four Chinese language proficiency tests, students were less likely to face problems with their listening and speaking skills, and they could understand and speak Chinese fluently. As for Chinese reading and writing, the overall performance of students also declined with age, and the failure rate remained high. Tan (2015) also found that Kelantanese Malay students in SJKCs had not acquired the Chinese language well. In addition, other studies have shown that many non-Chinese students from SJKCs do not perform well in the Chinese language (Bi, 2019; Ngien & Ching, 2016; Tay, 2012; Zeng, 2017).

4.3 Factors Affecting Chinese Language Acquisition Among Malay Students

This study found that Malay students' listening and speaking skills are pretty good, but their reading comprehension and writing skills are below satisfactory. It can be seen that there is an upward trend in the failure rate against the years of study. What causes this phenomenon? The researchers believe that the main reason for this phenomenon is the difficulty of mastering Chinese characters. The Chinese characters' characteristics, a combination of shapes, sound, and meaning, are complex for Malay students to master. This probably is because the Malay language is only a combination of sound and meaning. Hence it is rather challenging to incorporate the "shapes" into their learning process. Malay students could perform well in listening and speaking because they are taken off the "shape". They have performed well in Chinese Writing and Reading Comprehension in Year 1, but their results dropped from Year 2. The number of students who could not master the subjects got higher by year. According to Krashen's Input Hypothesis, the language learning materials must be "slightly" higher than the learners' current language level to be understood effectively. If the input language materials are too deep or much higher than the students' level, this will cause difficulty or no benefit on language skill improvement (Krashen, 2013). We can see from the students' results that they could cope well in Year 1 due to the two years of Chinese pre-school training, which provided them with basic Chinese language knowledge and conversation skills. However, starting from Year 2 and 3, the course contents become more complex and extensive. If the students do not have a strong Chinese language foundation, they will face learning difficulties in the process. It will be even more challenging when students proceed to upper-primary (Year 4-6) because the input language materials are far too difficult for their current language level, which causes difficulties in understanding and learning. This situation has led to a higher failure rate or below-satisfactory performances for Chinese Reading Comprehension and Chinese Writing results.

Besides that, external factors such as the Malay students' family background and living environment also affected their Chinese language acquisition. According to the data collected, most of the students were from lower and middle-class families (91%), of which 46.8% of their household income was less than RM3,000. The financial status may also be one of the main reasons for students not attending tuitions after school, and it was discovered that a total of 46.9% of the students did not attend tuition. The researchers also found out from the parents' survey feedback that they want their children to speak, read and write in Chinese. Still, from the interview with the Chinese teachers, we found that the parents had low expectations of their children's academic performance. From the teachers' point of view, most parents did not emphasise their children's academic performance. Students also stated that no one was home to help them with their homework when they faced problems because their family members did not understand Chinese (54%). In addition, many Malay students also stated that they did not communicate in Chinese with their family members nor community after school hours. Only 22.4% of the Malay students indicated that they spoke Chinese at home. Language-communication is an effective way to acquire and improve language proficiency. The limited possibility of applying the Chinese language in the community will affect Chinese language acquisition as well. Past studies by Bi (2019), Heng and Neo (2005), and Tan (2015) have also revealed that the family background, parental expectations, and language used at home have affected Chinese language acquisition among non-Chinese students.

Krashen (1981, 1988) believed that the learner's motivation, characteristics, and emotional state would affect the speed and quality of language acquisition. The teachers' survey and interview data show moderate or minimal motivation and poor attitude among Malay students towards Chinese language learning. The teachers stated that many students were not interested in learning Chinese. Most of them learned Chinese to meet their parents' wishes. Krashen believes that learners with low anxiety levels tend to get more comprehensible language input in second language acquisition in students' emotional states. Students who learn in a relaxed and comfortable mood will learn better in a short time. The student survey data shows that many Malay students are learning with anxiety. This is supported by the findings from "I feel scared during the Chinese test (M=3.98, S.D.=1.15)" and "I feel stress when my Chinese score is not good (M= 3.81, S.D.=1.26)". Many students felt that "Chinese is difficult to learn (M=3.4, S.D.=1.11)", and they "always could not keep up with the teacher's teaching pace (M= 2.78, S.D.=1.04)". They "don't like to learn Chinese (M=2.59, S.D.=1.18)". These negative emotional states will undoubtedly affect the students' learning motivation and their mastering of the language.

5. CONCLUSION

To sum up this study, the main reason Malay parents in Klang want their children to learn Chinese is more inclined to instrumental motivation factors. Parents saw the economic value of the Chinese language, which is gradually increasing. They wanted their children to master the Chinese language hoping for better employment opportunities in the future. In addition, parents also hoped that SJKC's education system could nurture their children to be more disciplined, academically inclined, and competitive. In terms of performance, the overall Chinese language performance of Malay students in SJKCs is not ideal. Most of the teachers interviewed also said that there were very few students with good grades, and most of them were in the lower and middle grades. The factors affecting the students' Chinese language acquisition mainly include students' academic ability, emotional attitude and motivation. External factors that influenced their achievement included the family's lack of an excellent Chinese language environment, parents having low expectations of their children's learning achievements, and a lack of spiritual and material support.

This study shows that parents' expectations towards their children's academic results will impact their children's performance in school. Parents should give more attention and support to their children's studies as early as possible. The reason being the higher-level language skills are built on fundamental knowledge and skills. If there is no proper support during the foundation period, it will be even more challenging for the students to catch up as time goes by or even worse, they might lose passion and give up on certain academic subjects. Therefore, the Malay parents who want to send their children to SJKCs should let their children receive at least two years of Chinese preschool education from mastering the basic Chinese speaking and Chinese characters writing skills. Parents who do not understand Chinese should also arrange tuition classes for their children. In addition, the Chinese language, in any case, is a second language to Malay students. Still, the Chinese subjects taught in SJKCs are based on first language teaching methodology, which may not be very suitable for Malay students. Suppose parents' expectation towards children's language skills is simply speaking Chinese and understanding simple Chinese characters. In that case, they should consider sending their children to National Schools (SK) that offer Chinese lessons. Chinese lessons conducted in SKs are taught based on second language methodology, which is more suitable for non-Chinese beginner learners.

The current study has two main implications. First, this research has enriched the study on Malay students' learning phenomenon in Chinese primary schools, as there is still a lack of study on the learning issues faced by Malay students in SJKCs in Selangor. Second, this study validates findings from previous studies on the academic performance of non-Chinese students in SJKCs. Non-Chinese students' learning performance in SJKCs is generally below the acceptable standard, making it a significant challenge for teachers in conducting their lessons, switching between first language and second language teaching approaches, fulfilling different needs in class. Malaysia Education Ministry and Jiao Zong may need to consider providing more training related to second language teaching methods and strategies for Chinese teachers servicing in SJKCs, hoping to enhance the language performance of Malay students and other non-Chinese students.

The data of this study was obtained from only teachers, Malay students and parents from five schools in the state of Selangor. Thus, this study cannot represent the learning situation of Malay students of entire SJKCs in Malaysia. As such, future research should include more schools and participants to be representative of the actual situation. The limitation of this research points towards how the topic should be addressed in the future. The following are a few suggestions for future studies: (1) A study on the overall academic performance of Malay students in SJKCs and the relationship between Chinese language proficiency and other subjects using Chinese language as a medium; (2) The challenges of classroom teaching as a consequence of the admission of Malay students to SJKCs, and how the schools and teachers address this.

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