TECHNICAL COMMUNICATION PEDAGOGICAL MODEL FOR AN INDUSTRY-BASED CURRICULUM IN MALAYSIAN VOCATIONAL COLLEGES

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FACULTY OF EDUCATION
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TECHNICAL COMMUNICATION PEDAGOGICAL MODEL FOR AN INDUSTRY-BASED CURRICULUM IN MALAYSIAN VOCATIONAL COLLEGES

ABSTRACT

Poor interaction between Technical and Vocational Education and Training (TVET) curriculum developers, instructors and industry in designing a sound curriculum has resulted in poor mastery of communication-for-work skills among TVET graduates. Consequently, this situation has affected their employability. Developing technical communication is beneficial in equipping students with communication skills that are valued by their future employers in the industry. Hence, this study is to develop technical communication pedagogical model (TCPM) for an industry-based curriculum in Malaysian Vocational Colleges, based on three research objectives: a) to identify the key determinants of TCPM for Malaysian Vocational Colleges from industry and TVET experts' perspectives, b) to propose TCPM for Malaysian Vocational Colleges and c) to evaluate the effect of English language proficiency on the development of TCPM for Malaysian Vocational Colleges. This study employs fuzzy the delphi method (FDM) to identify the key determinants of TCPM and a survey design with the Partial Least Square-Structural Equation Modeling (PLS-SEM) analysis to develop the model. In the initial phase, 17 experts from local TVET institutions and industry were selected for the FDM. Generally, the panel of experts agreed that the objective of TCPM should focus on guiding English language instructors in developing relevant technical communication skills and ensuring the learning environment is conducted parallel to the concept of an industry-based curriculum. The content of learning should focus on developing oral technical communication, written technical communication, interpersonal and researching skills. In addition, the method of delivery should focus on providing authentic learning activities that allow students to apply technical communication. For assessment method, evaluation can be conducted through observations on students' communicative experiences in an authentic setting, presentations and terminology exams. The experts also agreed that the ability to comprehend information, and apply accurate sentence structure, verbal strategy and grammar in conversation are important for technical communication skills development. From these findings, a survey questionnaire is developed and administered on 205 English language instructors in Vocational Colleges across six zones (Northern, Central, Southern, East Coast, Sabah and Sarawak) in Malaysia using random stratified sampling method. The data is analyzed using the PLS-SEM, SmartPLS. Overall, all constructs have a positive and significant effect on perceived importance of TCPM (Objective: p=0.012, t=2.249, Content of Learning: p=0.032, t=1.852, Assessment Method: p=0.000, t=4.196), except for Method of Delivery (p=0.301, t=0.522). The level of coefficient of determination is found to be moderate (R^2=0.526). The result of effect size (f^2) analysis indicates that all constructs have a small effect size (Objective: f^2=0.032, Content of Learning: f^2=0.027, Assessment Method: f^2=0.116), except for Method of Delivery with effect size of 0.002. The model has also achieved acceptable predictive relevance (Q^2=0.316). For mediation analysis, it is found that perceived importance of English language proficiency is a complementary partial mediator for Content of Learning and Assessment Method construct. In short, the proposed TCPM can be a reference in implementing technical communication in Malaysian Vocational Colleges, as it has considered the professional opinions of various industry experts, TVET experts and English language instructors.

Keywords: Technical communication, vocational colleges, pedagogy.

MODEL PEDAGOGI KEMAHIRAN KOMUNIKASI TEKNIKAL UNTUK KURIKULUM BERASASKAN INDUSTRI KOLEJ VOKASIONAL DI MALAYSIA

ABSTRAK

Interaksi yang lemah antara penggubal kurikulum, instruktor Pendidikan dan Latihan Teknik dan Vokasional (PLTV) dan industri dalam pembangunan kurikulum yang mapan telah menyebabkan penguasaan kemahiran komunikasi untuk pekerjaan yang lemah dalam kalangan graduan PLTV. Kesannya, situasi ini telah mempengaruhi kebolehpasaran mereka. Pembangunan kemahiran komunikasi teknikal adalah relevan untuk memastikan graduan mempunyai kemahiran komunikasi yang dikehendaki majikan di industri kelak. Justeru, kajian ini telah mencadangkan model pedagogi kemahiran komunikasi teknikal (MPKKT) untuk kurikulum berasaskan industri Kolej Vokasional di Malaysia berdasarkan tiga objektif kajian: a) mengenal pasti penentu utama bagi MPKKT Kolej Vokasional di Malaysia berdasarkan perspektif pakar PLTV, b) mencadangkan MPKKT Kolej Vokasional di Malaysia dan c) menilai kesan penguasaan berbahasa Inggeris terhadap pembangunan MPKKT Kolej Vokasional di Malaysia. Kajian ini menggunakan kaedah *fuzzy delphi* (KFD) bagi mengenal pasti penentu utama bagi MPKKT dan kaedah tinjauan dengan analisis *Partial Least Square-structural equation modeling* (PLS-SEM) bagi membangunkan model ini. Dalam fasa awal, 17 pakar dari institusi PLTV dan industri tempatan dipilih untuk KFD. Secara umumnya, panel pakar bersetuju bahawa objektif MPKKT perlu berfokus dalam memberi panduan kepada instruktor Bahasa Inggeris bagi membangunkan kemahiran komunikasi teknikal yang relevan dan persekitaran pembelajaran yang dilaksanakan selari dengan konsep kurikulum berasaskan industri. Bagi kandungan pembelajaran, fokus perlu diberikan kepada pembangunan kemahiran komunikasi teknikal lisan, penulisan, interpersonal dan penyelidikan. Selain itu, kaedah penyampaian perlu berfokus kepada menyediakan aktiviti pembelajaran yang autentik untuk pelajar mengaplikasi kemahiran komunikasi teknikal. Bagi kaedah penilaian, proses ini boleh dilaksanakan melalui pemerhatian terhadap pengalaman komunikasi pelajar dalam situasi autentik, pembentangan dan ujian terminologi. Panel pakar juga bersetuju bahawa kebolehan memahami maklumat dan mengaplikasi struktur ayat yang tepat, strategi dan tatabahasa dalam komunikasi lisan adalah penting untuk membangunkan kemahiran komunikasi teknikal. Berdasarkan dapatan ini, satu borang soal selidik telah dibangunkan dan ditadbir kepada 205 instruktor Bahasa Inggeris di Kolej Vokasional merentasi enam zon (Utara, Tengah, Selatan, Timur, Sabah dan Sarawak) di Malaysia, menggunakan kaedah pensampelan rawak berstrata. Data pula dianalisis menggunakan PLS-SEM, *SmartPLS*. Secara keseluruhan, kesemua konstruk mempunyai kesan yang positif dan signifikan ke atas kepentingan MPKKT (Objektif: p=0.012, t=2.249, Kandungan Pembelajaran: p=0.032, t=1.852, Kaedah Penilaian: p=0.000, t=4.196), kecuali Kaedah Penyampaian (p=0.301, t=0.522). Dapatan analisis *coefficient of determination* adalah pada tahap sederhana (R^2=0.526). Dapatan analisis *effect size* (f^2) menunjukkan kesemua konstruk mencapai tahap kecil (Objektif: f^2=0.032, Kandungan Pembelajaran: f^2=0.027, Kaedah Penilaian: f^2=0.116), kecuali Kaedah Penyampaian dengan nilai 0.002. Model ini juga telah mencapai tahap memuaskan bagi analisis *predictive relevance* (Q^2=0.316). Bagi analisis pengantara, didapati kepentingan penguasaan berbahasa Inggeris memainkan peranan sebagai pengantara *complementary partial* bagi konstruk Kandungan Pembelajaran dan Kaedah Penilaian. Ringkasnya, MPKKT yang dicadangkan boleh dijadikan rujukan untuk mengimplementasikan komunikasi teknikal dalam konteks Kolej Vokasional di Malaysia kerana model ini mengambil kira pandangan profesional

pakar dari pelbagai industri, pakar PLTV dan instruktor Bahasa Inggeris.

Kata kunci: Komunikasi teknikal, kolej vokasional, pedagogi.

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CHAPTER 1

INTRODUCTION

Introduction

This chapter presents the underpinning issues of unemployment in global and localized context of Malaysia. It is believed that one of the major contributing factors to unemployment is a poor mastery of technical communication skills. In short, the discussion in this chapter provides an in-depth analysis of this issue and justification to improve mastery of technical communication skills among vocational college students in Malaysia.

Background of Study

The landscape of global employment. In the recent years, many countries, even the developed ones, are still struggling with poor employment rate. Dobbs and Madgavkar (2014) have presented the landscape of employment and its challenges based on comparison of 70 nations that are categorized into eight clusters (Young Developing, Young Middle-Income, India, China, Young Advanced, Russia and CEE, Southern Europe, and Aging Advanced). One of the most striking findings from this study is the shift of global market demands from manufacturing to service sectors. With the advancement of technology and global networking, service sector has accelerated and become a priority in most countries. Dobbs and Madgavkar (2014) noted that the shift has increased the unemployment rate. This is because, in manufacturing sector, the employed workers were from low to medium-skill workers. However, with the advancement of technology, service sector has demanded high-skilled workers to relapse the existing workers. Dobbs and Madgavkar (2014) believe that the levels of education reflect their employment skills. Typically, the low-skill workers have only completed primary education, compared to medium-skill workers, who have completed secondary education. On the other hand, the high-skills workers are graduates from tertiary education and are expected to have knowledge and expertise in the field of work. Hence, the service sector seeks graduates from tertiary education with required expertise to help advancing its development and contribution. For instance, in a global landscape, there is an increase in labour market in 2010, where the number of tertiary education graduates to work in the industry has increased by 2.5 times in developing economic countries and doubled in advanced economic countries, since 1980.

Even worrying, in a large scale “momentum” case analysis by Dobbs and Madgavkar (2014), through the analysis of education qualification data across 70 nations (which are categorised into eight clusters - Young Developing, Young Middle-Income, India, China, Young Advanced, Russia and CEE, Southern Europe, and Aging Advanced) has predicted the trend of global employment. The results stated that there will be a potential shortage of 38 to 40 million high-skill workers and a surplus of 89-94 million low-skill workers across these nations. The imbalance quantity of workers needed with the demand of the industry is a call of concern. Thus, relevant alternatives should be taken into consideration.

In another recent report by Mourshed, Patel and Suder (2014), they have specifically zoomed this problem across eight European Union (EU) countries (France, Germany, Greece, Italy, Portugal, Spain, Sweden, and the United Kingdom). The findings revealed that 75% of youth unemployment across 28 EU countries were from these eight countries. A number of studies have appointed that there is a mismatch between the expectations and production of skilled workers through education institutions with the expectations of the industry (Mourshed et al., 2014; Nagendra, Radha & Naidhu., 2013; Oxtoby, 1997). Also, a large-scale survey by Mourshed et al., (2014) have explored youth, employers and education providers' views on employment skills, market needs and educational institutions' preparation in understanding this global issue. For instance, in 2013 the unemployment rate in Greece was above 55% and this scenario was similarly experienced in Sweden and Germany. Very interestingly, this survey has found a mismatch of expectations between the education providers and employers. It is noted that the education providers rated themselves highly as an effective agent to prepare the youth for the job market. Very differently, the selected employers rated the graduates as poorly prepared for the work field. Even disheartening, the youth viewed themselves as inadequately prepared, and thus, affecting their performances in the work field.

Unemployment in Malaysia. Reflecting on the above issue in the context of Malaysia, a similar concern should be addressed as the neighbouring country, Indonesia is predicted by Dobbs and Madgavkar (2014) to face challenges in increasing the number of high-skill workers for the industry. Since Indonesia and Malaysia share almost identical GDP (Gross Domestic Product) growth annual percentage, where 4.8% for Indonesia and 5.0% for Malaysia in 2015 (The World Bank, 2016b). It is relevant to state that Malaysia should also be focusing on increasing the number of labour force, especially the high-skill workers. They further elaborated that the demand for tertiary education graduates will increase by year, and is predicted to reach 60% increase by 2030.

Interestingly, the unemployment rate in Malaysia is almost stagnant since 1996. It is reported that the unemployment rate was found to be the lowest in 1997, at 2.4% (The World Bank, 2016a), and ever since, the rate has increased but is still at

3.0%, in January 2015 (Department of Statistics Malaysia, 2015).

Even though the unemployment rate in Malaysia appears to be low, a detailed analysis of unemployment rate (as presented in Table 1.1 and 1.2 below) may provide an in-depth understanding of this complex issue. In Table 1.1, the Department of Statistics Malaysia (2016) reported that the highest unemployment rate based on education background is dominated by graduates from secondary education (with 56.48% in 2014) and followed by tertiary education (with 30.67% in 2014). The unemployment rate for secondary education level is inconsistent over the years. There is an improvement in 2011 with 3.76% decrease compared to 2010, but it increases in 2012 with 3.93% difference. In 2013, the rate again decreases to 57.2% (a decrease of 2.02%) and 0.72% difference in 2014.

On the other hand, for tertiary education, the unemployment rate has gradually increased starting 2011 (exception in 2012) to 2014. It is found that the highest unemployment rate for this group is witnessed in 2014, with 30.67% (an increase of 4.86% compared to 2013 and 7.96% compared to 2012).

Table 1.1

Unemployment rate (percentage) according to levels of education

Level of Education	**(%)2010**	**(%)2011**	**(%)2012**	**(%)2013**
UPSR or equivalent (Primary)	10.98	10.37	10.17	10.00
Total (Primary)	**10.98**	**10.37**	**10.17**	**10.00**
PMR/SRP or equivalent (Lower Secondary)	12.71	12.31	10.72	11.23
SPM or equivalent (Upper Secondary)	42.21	39.22	44.66	41.73
STPM or equivalent (Upper Secondary)	4.13	3.76	3.84	4.24
Total (Secondary)	**59.05**	**55.29**	**59.22**	**57.2**
Certificate (Tertiary)	3.61	4.16	3.58	4.10
Diploma (Tertiary)	8.23	9.96	9.59	11.14
Degree (Tertiary)	8.51	11.52	9.54	10.59
Total (Tertiary)	**17.43**	**25.64**	**22.71**	**25.81**
No Certificate	5.59	4.42	4.39	3.72
Total (No Certificate)	**5.59**	**4.42**	**4.39**	**3.72**
Not Applicable	4.10	4.27	3.51	3.25
Total (Not Applicable)	**4.10**	**4.27**	**3.51**	**3.25**

Adapted from Department of Statistics Malaysia (2016).

To further untangle this complex issue, Table 1.2 provides a clearer landscape of labour force in Malaysia. Generally, our labour force is dominated by graduates from secondary education level. Over the years, there is a gradual increase on the percentage of workers with secondary level qualification. For instance, 54.79% of secondary school graduates were reported to be working in our country in 2014 compared to 53.86% in 2010, 54.23% in 2011, 54.55% in 2012, and 54.79% in 2014. However, a closer analysis on this statistic reveal that over the years, the percentage difference of the labour workers with secondary level education has decreased. For instance, from 2010 to 2011, the increase is 0.37%, whereas starting from 2013, the difference is very small, with only 0.03% increase.

On a contrary, the number of workers with tertiary education level have increased over the years (except in 2012). In 2014, 23.45% workers are graduates with certificate, diploma and degree certification. However, the pattern of employment among tertiary education graduates is inconsistent. In 2011, there is an increase of 1.09% compared to 2010. Nevertheless, in 2012, the percentage has decreased by 0.07% but starting to slightly increase, with a difference of 0.49% in 2013 and the highest increase is 1.99% in 2014.

What appears to be worrying is the fact that the findings of "momentum" case analysis by Dobbs and Madgavkar (2014) predicted that all countries including Malaysia (under Young Developing cluster) will face shortage of high-skill workers and an exceeding number of unemployment among low to medium-skill workers in the future. However, based on the 5-year analysis of unemployment and labour force rate (Department of Statistics Malaysia,2016; 2016a), as discussed earlier, Malaysia is currently facing challenges in resolving increasing unemployment rate and the labour force pattern, which is still being dominated by medium-skill workers. Even though in 2014 an increase of 1.99% (the highest over four-year frame) is reported, the number of workers from tertiary education level is still below 24%. A possible reason to this problem is a mismatch between the quality of graduates from tertiary education with the needs of the current industry. Devadoss (2012) elaborated that most employments in Malaysia are in service and manufacturing industries, however the shortage of labours still occurs due to the mismatch between the outcomes of educational institutions and the needs of the industry.

Table 1.2

Labour force rate (percentage) according to levels of education

Level of Education	(%)2010	(%)2011	(%)2012	(%)2013	(%)2014
UPSR or equivalent (Primary)	12.86	12.84	13.03	13.28	12.44
Total (Primary)	**12.86**	**12.84**	**13.03**	**13.28**	**12.44**
PMR/SRP or equivalent (Lower Secondary)	14.17	14.23	14.43	14.16	13.67
SPM or equivalent (Upper Secondary)	36.64	36.98	37.11	37.61	38.11
STPM or equivalent (Upper Secondary)	3.05	3.02	3.01	2.99	3.01
Total (Secondary)	**53.86**	**54.23**	**54.55**	**54.76**	**54.79**
Certificate (Tertiary)	2.32	2.50	2.40	2.23	2.56
Diploma (Tertiary)	8.05	8.69	8.29	9.02	9.47
Degree (Tertiary)	9.73	10.00	10.33	10.21	11.42
Total (Tertiary)	**20.10**	**21.19**	**21.02**	**21.46**	**23.45**
No Certificate	9.50	8.57	8.33	7.55	6.74
Total (No Certificate)	**9.50**	**8.57**	**8.33**	**7.55**	**6.74**
Not Applicable	3.68	3.16	3.06	2.94	2.58
Total (Not Applicable)	**3.68**	**3.16**	**3.06**	**2.94**	**2.58**

Adapted from Department of Statistics Malaysia (2016a).

To further support, a number of research, such as Pandian and Narasuman (2004), Ismail, Yusof and Lai (2011), and Shuib (2005) have appointed that fresh graduates from our local universities and institutions are still lacking in their employability skills. What is more worrying is that the graduates with excellent academic achievement are still struggling to secure a job relevant to their qualification (Hanapi & Nordin, 2014; Singh, Narasuman & Thambusamy, 2012). This is reflected in the percentage of labour force and unemployment rate of tertiary education graduates, as presented and discussed earlier.

Communication and employability skills. In a detailed description of employability skills, a number of studies have highlighted technical, management, interpersonal, thinking, and information and technology skills as the competencies required by the industry (Lynch, 2000; Robinson, 2000; Schermerhorn, 2008). However, the current global industrial settings seek for "generalisable" skills that do not only restrict to a specific job or working setting, but also applicable across various fields (Burganova & Valeev, 2015; Tabbron & Yang, 1997). In Tabbron and Yang's (1997) work, they illustrated how the post-Fordist in United Kingdom has made their economic competitions and productions more challenging and demanding. Among the highlighted prominent skills are information skills, flexibility in performing multiple tasks and communication skills (Raffe, 1994). These skills, as viewed by Tabbron and Yang (1997) are highly relevant to the current industry as the advancement of technology has demanded workers to be more 'flexible' in conducting multiple tasks in a work place. Other researchers such as Lynch (2000), Male, Bush and Chapman (2011) similarly agreed on the importance of developing communication skills as a set of skills that help to enhance employability.

In the localized context of Malaysia, a number of studies have appointed the importance of communication skills to employment (Azian & Mun, 2011; Rahmah et al, 2011; Rasul, Ismail, Rajuddin & Rauf, 2010; Zubaidah & Rugayah,2008). In fact, communication skills are found to be lacking among graduates in Malaysia (Hanapi & Nordin, 2014; Osman, Bachok, Muslim & Bakri, 2015; Shuib, 2005; Singh et al., 2012). Therefore, there is a need to develop a strong foundation of communication skills among students, because these skills are not only required but industry but also are deemed to be generalizable in advancing performance at work.

Education as a platform to develop future labour force. In addressing the above issue, education is believed to be an effective platform to equip students with content knowledge and relevant working skills. As outlined by the United Nations Educational. Scientific and Cultural Organization (UNESCO) (2011), Technical and Vocational Education and Training (TVET) is aimed to prepare and equip students with: a) general educational knowledge, b) technical and scientific knowledge, and, c) practical skills, attitudes and understanding of numerous fields of work. This concept has been found to be practiced in Malaysian context. The Malaysia Education Blueprint 2013-2025 (Ministry of Education Malaysia, 2012) has outlined the direction of basic vocational education and vocational college, where these two main education lines are aimed to produce skilled workers in dealing with unemployment rate and labour shortage in Malaysia. Both education lines focus on providing vocational training (70%) and academic education (30%). Interestingly, the junior vocational education has been introduced in lower secondary level and the Level 2 of the Malaysian Skills Certificate is offered upon completion, as early as 15 years old. This initiative is found to be relevant in producing future skilled workers as the similar approach has been implemented in the advanced countries. For instance, in Korea, the introduction of vocational middle schools is aimed to provide an early introduction to the importance of vocational and technical skills to the industry and to develop high-skill workers for the country. In achieving this, the Ministry of Education, Science and Technology Korea (2011) has implemented numerous efforts in providing high quality education and at the same time producing future workers with relevant skills to the industry. One of the efforts is to strengthen networking with Human Resource Development Service of Korea (HRD Korea) and Korea Chamber of Commerce and Industry (KCCI) to research on industry needs and suitable trainings to be integrated in TVET institutions. Similarly, in the United States of America (USA), Career and Technical Education (CTE) has been introduced in high schools across the country. According to Careertech (2014), the National Career Clusters (NCE) is used as the guideline to introduce numerous vocational courses or subjects in the USA. At the moment, Careertech (2014) outlines 16 clusters of work, with more than 79 career paths for students. As the result, the introductory subjects to the working cluster have been designed according to the skills required by the industry and are being translated into curriculum for vocational schools.

Linking the above discussion to the practice in Malaysia, Yunos, Ahmad, Kaprawi and Razally (2006) conclude that the introduction of vocational colleges (as early as lower secondary level) is a relevant measure to develop a strong foundation of technical skills and career development of the students. The underlying principles of Malaysian TVET, such as to produce students who are knowledgeable and competent future workers (Holistic K-workers) are among the projections of what Malaysia needs in future (Hasmori, Yunos, Hamza & Aripin, 2014; Ministry of Education Malaysia, 2011). The concept of Holistic K-workers emphasizes on the development of balanced competencies of technical, learning methodology, and social which are the important competencies for the work field (Jessup, 1991; Mighat &

Yasin, 2010; Yunos et al., 2006; Wellington, 1993). In order to achieve this, TVET in Malaysia has similarly followed the practice in the advanced countries. One of the major efforts is to extend technical skills development and training in Malaysian TVET institutions by enhancing networking with the industry or known as industry partner outreach efforts (Ministry of Education Malaysia, 2012). In the blueprint, all states are categorized into six corridors, which function as agents of expertise for collaboration with vocational schools. For instance, the Northern Corridor Economic Region (NCER) is specialized in the field of information technology (IT), agriculture and tourism. The Eastern Corridor Economic Region (ECER) provides expertise in renewable oil, gas and power, agriculture, as well as transport and logistics. The Greater KL/Klang Valley focuses on transport and logistics, health science, finance, and tourism. The Iskandar Malaysia (Johor) provides expertise in logistic and transportation, IT, agriculture, tourism, and manufacturing. The Sabah Development Corridor (SDC) provides training for the field of renewable oil, gas and power, marketing and sales, manufacturing, and tourism. Lastly, the Sarawak Corridor of Renewable Energy (SCORE) focuses on renewable oil, gas and power, transport and logistics, tourism, as well as agriculture and fishery. With the collaboration with these corridors, it is hoped that the production of skilled workers can be increased for the future.

In short, the current practice of Malaysian TVET is potential in dealing with unemployment issue and shortage of skilled labour in Malaysia. Based on this belief, the Ministry of Education Malaysia has outlined and taken relevant measures, such as introducing vocational colleges at lower secondary level, and improving the quality of delivery and practice by introducing industry partner outreach efforts, as outlined the Malaysia Education Blueprint 2013-2015 (Ministry of Education Malaysia, 2012). It is hoped that these measures are able to realize the production of Holistic K-workers for the future. However, the unresolved issue of poor communication skills among the graduates in Malaysia is still worrying. As one of the core competencies in Holistic K-workers framework, communication skills play an important role to enhance the employability of the graduates. As discussed in the previous section (Communication and employability skills), communication skills are still lacking not only among gradates in Malaysia (Hanapi & Nordin, 2014; Osman, Bachok, Muslim & Bakri, 2015; Shuib, 2005; Singh et al., 2012) but also from the advanced countries, such as in the USA (Lang, Cruse, McVey & McMasters, 1999; Seat, Parsons & Poppen, 2001; Reaves, 2004). Therefore, this calls for an in-depth analysis of this issue, which has affected not only the quality of the educational institutions but also the labour force of the country in a long-term run. An early introduction to technical communication in vocational colleges might provide a promising future to resolve this issue. Wellington (1993) agreed on the early introduction of TVET as the medium to provide a strong foundation of technical skills, knowledge and employability skills. In fact, technical communication skills have been associated with communicative competencies for the industry (Brinkman & van der Geest, 2003; Reaves, 2004; Rus, 2014) and are viewed as the generalized skills that help workers to communicate effectively at work (Burganova & Valeev, 2015; Tabbron & Yang, 1997). Hence, it is relevant to consider the introduction of technical communication skills in vocational colleges in Malaysia.

Statement of Problem

Current body of literature suggested that one of the major impediments to employment is poor communication skills (Mourshed, Patel & Suder, 2014; Nagendra et. al, 2013; Oxtoby, 1997; Tabbron & Yang, 1997). In a large-scale survey across eight EU countries, communication skills (in English) are found to be immensely important across different industries (Mourshed et al., 2014). Evidently, they also noted that communication skills were the largest skills gap across primary, secondary, tertiary industry and public services. On top of that, written communication skills have found to be the largest skills gap for the public service. Consequently, poor mastery of communication skills (oral and written) might result in incompetency at work and thus, affecting their employment. This is because communication skills have been established as one of the prominent work-based competencies (Burganova & Valeev, 2015; Lynch, 2000; Robinson, 2000; Schermerhorn, 2008Tabbron & Yang, 1997).

Nevertheless, the UNESCO-UNEVOC's efforts to improve the quality of education and youth employment through TVET institutions have been conducted and are aimed to be: a) an integral part of general education, b) a platform to effectively prepare students for working fields, c) an initiative to lifelong learning, d) an effort to promote sustainable development, and e) a medium to close the gap of poverty across countries (UNESCO, 2011). The concept of industry-based education (as termed by Jessup (1991)) is the underpinning principle to TVET. According to Jessup (1991), industry-based education aims to develop 'mental' (knowledge) and 'manual' (technical) elements that have relative contributions to work-related skills. Both elements are the foundation that should be developed in schools in order to provide a strong foundation of technical knowledge and skills in preparing students for the workforce. In recent years, TVET institutions across the globe have been trying to equip students with both elements (mental and manual) and the extension of employability skills such as resource, interpersonal, information, system, technology, thinking skills and professional qualities (Robinson, 2000; Singh et al., 2013; Wellington, 1993). For instance, in the developed countries, such as in United States of America, Korea and Australia, the major focus of TVET is to integrate academic development with technical and employability skills. Therefore, TVET has been introduced in secondary schools, with extensive networking with higher technical institutions and industries (Careertech, 2014; National Centre for Vocational Education (NCVER), 2007; Park, 2011).

However, the current scenario of unemployment across the globe notes that the outcomes of TVET institutions are still inadequate to produce skilled workers with a strong foundation of communication skills (Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997; Tabbron & Yang, 1997). Even disheartening, a current study by Mourshed et al. (2014) has discovered a mismatch of expectations between education providers, students and employers on the quality of TVET teaching and learning. The education providers strongly recommended that the outcomes of their teaching and learning were relevant and appropriate in realizing UNESCO's aspirations. In a direct opposite, the employers expressed that much of teaching and learning, even the training were still inadequate to match the demand of the working fields. In addition, less than half of the graduates felt that their post-secondary studies have prepared them sufficiently for the work force.

A similar concern was also expressed and experienced in other countries, such as in Bangladesh, India and even Malaysia. Oxtoby (1997) explored the hindering factors of TVET institutions in providing skilled workers in accelerating Bangladesh's economic growth and found that their graduates faced difficulties to effectively express themselves in both oral and written forms. With growing demands for skilled workers, the polytechnics in Bangladesh seek to improve not only on its organization but also the inputs and outputs of education. Oxtoby (1997) has highlighted the increasing interest in developing communication skills as one of the influential elements in curriculum and quality assurance of TVET in Bangladesh. Similarly, in India, Nagendra et al. (2013) elucidated that communication skills are still one of the major hindrances to employability. They agreed the Department of Education, Employment and Workplace Relations, Commonwealth of Australia (2011), as they specifically mentioned that communication skills are still lacking and thus, relevant measures should be taken.

In the localized context of Malaysia, Ibrahim, Rahman and Yasin's (2012) study explores the landscape of teaching practices in selected TVET institutions. They found that the students were moderately satisfied with the curriculum, training delivery and equipment, as well as the instructors. This might pose challenges to further develop students' confidence and to prepare them for the work. This condition is similar to the findings in Mourshed et al.'s (2014) study. In fact, Ibrahim et al. (2012) agreed that students' feedbacks and satisfaction are an accurate reflection of TVET curriculum effectiveness. Clearly, our TVET curriculum is still facing a challenge in producing high-skill workers, and thus, intensive improvements should be proposed and taken into consideration. In line with Minghat and Yasin's (2010) sustainable framework of Malaysian TVET, robust educational emphases should be given not only on content knowledge and technical skills, but also on communication skills development. Again, socialization, which is depending on communication skills, is an important element to ensure students' employment in future as highlighted in this framework.

This peculiar and unresolved issue seems to be discussed relentlessly in TVET literature. The current body of literature seems to provide limited knowledge on alternatives to this issue. This is because, what has been presented in the literature is majorly focusing on the role of TVET in accommodating economic growth, by furnishing skilled workers to improve productivity, and TVET aspirations to alleviate poverty and advancing economic growth (Nagendra et al., 2013; Odora & Naong, 2014; Oxtoby, 1997; Tabbron & Yang, 1997). Even though communication skills have been proven to be lacking among students or graduates (Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997; Tabbron & Yang, 1997), the current body of literature seems inadequate to mark the next step to improve communication skills in TVET institutions. One of the major concerns is the direction of language learning in TVET institutions. Nagendra et al. (2013) agreed that there is no clear direction to guide curricula design and assessment for communication skills development. It is undeniable that numerous frameworks are readily available to generally guide the direction to sustain the quality of TVET learning (i.e The Australian Chamber of Industry and Commerce and Business Council of Australia framework, Minghat and Yasin's (2010) TVET sustainable framework, Malaysian Qualification framework, and Malaysian Skills Certification framework) but, the content of the teaching and learning to promote and improve communication skills is still limited and inadequately discussed. Nagendra et al. (2013) supported that despite the educational emphases on the framework, little attention was given on an operational definition to guide curriculum designing and assessments development. It is certainly doubtful to simply generalise the available language learning content to TVET learning context. DeLamater and Ward (2013) dwelt upon the fact that educational institutions serve as an effective platform to prepare students for anticipatory socialization at work in future. Learning about career path and skills required is being emphasized in Jablin's (1987) theory of organization assimilation and is best to be inculcated through education.

Nevertheless, a number of studies have suggested the implementation of technical communication course as an alternative to the above issue (Brinkman & van der Geest, 2003; Reaves, 2004; Rus, 2014). Rus (2014) argues that the general communication scheme only emphasizes on the roles of encoder, channel and receiver of the information. She strongly believes that the general communication scheme has overlooked on the roles of individuals, their professional characteristics, and special features and context of the communication in an authentic work-related communication setting. She continues to argue on the multitude of the communication in the general scheme, as she believes that communication at work requires more attention on specific purposes, forms and context on the process of communication. Her arguments are in line with other studies, such as in Brinkman and van der Geest (2003), Kunioshi, Noguchi, Hayashi and Toio (2012), Laverty (1979) and Reaves (2004). These researchers firmly agreed that technical communication should be introduced and implemented to specifically develop students' competency for technical work field. In the earlier work of Laverty (1979), it has been argued that the failure of general communication subject to equip TVET students with technical communication skills was rooted in its poor implementation and focus of this subject. Similar findings have been addressed in Nutman's (1987) study, where he noted that since 1960's to early 1980's, the general communication module in Engineering schools failed to equip students with a strong foundation of technical communication skills. As the result, these (Laverty, 1979; Nutman, 1987) and other recent studies (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane &Gibson, 1997; Male, Bush & Chapman, 2011) have proposed learning objectives to focus on technical communication in TVET settings, which aims to develop: a) interpersonal skills in establishing relationships, b) verbal presentations skills, c) writing skills, and d) researching skills, in presenting ideas to a specified audience in technical work settings (Brinkman & van der Geest, 2003; Marshall, 1982). Ideally, these clusters of skills are beneficial in equipping students with a strong foundation of technical skills. For instance, in the earliest studies on technical communication course, such as in Laverty (1979) and Marshall (1982), they have noted a positive acceptance to this course, and the students strongly believed that the communication skills developed through various authentic learning experiences were beneficial to their field of work. However, over the years, the development of technology and the changes in the global market needs (as presented in Dobbs and Madgavkar 's (2014) study) have resulted in a new set of skills that should be developed parallel to the demands of the industries. Dobbs and Madgavkar (2014) noted that the service sector is and will continue to dominate the global market in the coming decades, and thus changes in the skills of technical communication should be made to suit the needs of the industry. As the result, the current group of researchers have proposed additional skills under the technical communication such as critical literacy, intercultural communication, research, and information and technology skills, to integrated in the technical communication course (Brinkman & van der Geest, 2003; Cook, 2002; Lappalainen, 2010; Rus, 2014). Conclusively, technical communication has a promising potential to fill the gap of the continuous debates on how to improve communication skills among TVET students.

In an in-depth analysis of studies from 1979 to 2015, researchers have explored the implementation of technical communication from multiple lenses. To date, they have explored the elements of technical communication skills (Brinkman & van der Geest, 2003; Burganova & Valeev, 2015; Laverty, 1979; Keane & Gibson, 1997; Marshall, 1982; Male, Bush & Chapman, 2011; Nagendra et al., 2013; Nutman, 1987; Rus, 2014), content of teaching and learning of technical communication courses

(Brinkman & van der Geest, 2003; Burganova & Valeev, 2015; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Rus, 2014), integration of interactive learning platform in technical communication courses (Kunioshi, Noguchi, Hayashi & Toio, 2012; Marshall, 1982), methods of delivery (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Reaves, 2004), evaluation of the overall course (Burganova & Valeev, 2015; Ibrahim et al., 2012), assessment measures in technical communication courses (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Reaves, 2004; Yu, 2012), communication skills and students' background (Jalaludin & Ihkasan, 2014; Kunioshi et al., 2012; Yu, 2012), and technical communication and language education (Kunioshi et al., 2012; Lappalainen, 2010; Reaves, 2004).

The major implication that can be derived from the current themes in the literature is that these studies might serve as a foundation to develop a sound curriculum for technical communication skills in TVET institutions. Marsh and Willis (2007) exemplified that a curriculum development considers the context and content of learning, delivery methods and its educational outcomes. Linking these to the current themes in the literature, the content and context of learning of technical communication curriculum should include the elements (understanding audience, relationship, purpose and context of communication) and specific content of technical communication skills (developing written, oral and other relevant communication competencies) (Brinkman & van der Geest, 2003; Burganova & Valeev, 2015; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Rus, 2014). In selecting delivery methods to integrate and teach technical communication, the curriculum developer may consider the five delivery methods (partnership, team teaching, communication modules, expert feedback, and communication across the curriculum) (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Reaves, 2004) and the integration of technology in teaching (video projects and simulation games) (Kunioshi, Noguchi, Hayashi & Toio, 2012; Marshall, 1982). The outcomes of this curriculum are therefore to develop four major clusters of skills: interpersonal and group skills, information retrieval skills, technical writing skills, and oral technical communication skills. This also leads to the selection of assessment measures relevant to technical communication skills development. Across literature, project-based tasks, research reports, technical journalism, speeches and conference presentations are among the examples of assessment measures practiced widely in TVET institutions (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Reaves, 2004; Yu, 2012).

On the other hand, English language proficiency (ELP) skills should be emphasized along with technical communication skills development. In Dean and Bryson's (1961) communication process model, language system which refers to proficiency of language is important to effective communication process. They further elaborated that speakers should be able to possess both transmission and reception skills. Since technical communication concerns on effective communication for work, ELP is therefore important. In fact, technical communication falls under the umbrella of English for Specific Purposes (ESP). Strevens (1988) describes that ELP as a 'variable characteristic'. This means that the teaching and learning of technical communication should embed ELP. Other researchers have similarly exemplified the importance of ELP to communication at work (Bleakley & Chin, 2004; Chiswick &

Miller, 2014; Hošková-Mayerová, 2014). Therefore, it is important to include the development of ELP along with technical communication skills.

As outlined by Marsh and Willis (2007) the construction process of a sound curriculum in general should reflect four main domains, which are: a) understanding of the social environment; b) understanding of the nature of learner; c) understanding of the learning process; and d) understanding of the nature of knowledge. Interestingly, what appears to plague the current practice of teaching of technical communication skills is a mismatch between the industry needs and curriculum outcomes, which has resulted in poor acquisition of poor technical communication skills. Clearly, what is lacking is the understanding of the social environment in the work field and its translation into curriculum development. Marsh and Willis (2007) mentioned that the nature of students' world or society should be taken into consideration in developing curriculum. Therefore, the designed curriculum should harmonize the social needs, economic and political realities of a particular country.

The current landscape of technical communication teaching is still problematic. Reaves (2004) has represented this case clearly, as she mentioned that there is still a mismatch between the available technical communication courses and students' communicative competencies and skills. Her argument is supported by a number of surveys conducted by other researchers (Salazar, Suleski & Coleman, 2001; McGourty, 1999; Seat, Pearsons & Poppen, 2001) on the relevancy of this course from the views of industry practitioners and students. Reaves (2004) concluded that the findings of these studies indicated that there is still a challenge in equipping students with a strong foundation of technical communication skills. A logical justification of this condition is possibly because of poor interaction between curriculum designers, instructors, students and industry experts. Searle (2009) explained that a sound technical curriculum should consider the multiple lenses of the active agents in TVET institutions. Interestingly, what has been addressed in Reaves's (2004) study is parallel to Nagendra et al.'s (2013) report on the mismatch of expectations between employers and curriculum developers in realizing the TVET aspirations in India.

In addition, the understanding of the nature of learner, the learning process and knowledge should be given an equal emphasis. Evidently, there are still uncertainties on what delivery method is effective for delivering the content of technical communication learning. For instance, Reaves (2004) has explored the teaching delivery of technical communication courses across engineering schools in United States and Canada. She found that there were five different methods of delivery across these institutions. This finding exemplified that the practice of technical communication teaching differs across institutions, regardless of the similar needs of the industry. However, Reaves (2004) noted that communication across curriculum is beneficial to help develop technical communication skills. However, to simply generalize the available technical communication curriculum from one setting to another is strongly doubtful. This is because, Tabbron and Yang (1997) have addressed how the developmental pace of a country affect the demands for human resources. Therefore, an in-depth investigation on the needs of industry on technical communication skills should first be conducted, before designing the teaching and learning content for technical communication course.

On the other hand, Cook's (2002) study identified that there are still uncertainties to provide "…concise identification of literacies that technical communication should possess." (p.6), and how to integrate them in the teaching and learning process. The uncertainties might be the result of different teaching practices in different context as discussed earlier. In dealing with this, Cook (2002) calls for the development of framework that "…fully incorporates all of the literacies currently held to be important for technical communicators' workplace success." (p.6). Undeniably, there are a number of technical communication frameworks presented in the current literature, however there are slightly different from one to another. For instance, in Nutman's (1987) study, the development of comprehension and summary skills were addressed in the 'Integrative Studies' course. Whereas, in Lappalainen's (2010) work, the development of knowledge on business and finance has been integrated and viewed as an important competency to engineering students. With such discrepancies on how the framing of literacies and competencies of technical communication, there is a need to re-evaluate the current practice of technical communication in TVET institutions, and of course with a strong linkage with the industry needs.

In short, there is still a need to critically identify the current needs of the local industry in matching it with TVET curriculum development, especially on technical communication. In the localized context of Malaysia, the available studies have only explored the sustainable elements for Malaysian TVET (Minghat & Yasin, 2010), students' perceptions of the current quality of TVET (Ibrahim et al., 2012) and contributing elements that affect interpersonal communication skills among TVET students (Jalaludin & Ihkasan, 2014). With the discouraging findings of Blue Ocean Strategy report (MOEM, 2012), where the current courses or subjects were viewed as irrelevant for producing skilled workers, there is a need for an industry-based technical communication curriculum for Malaysian Vocational Colleges. In previous section (Unemployment in Malaysia), the statistics by the Department of Statistics Malaysia (2016; 2016a) showed that the graduates of upper secondary have the highest unemployment rate (42.21% in 2010, 39.22% in 2011, 44.66% in 2012, 41.73% in 2013 and 41.33% in 2014). Also, in producing more high-skill workers, the students in secondary level should receive an early introduction to technical communication skills as they are the future for Malaysia's economic development. In fact, in Minghat and Yasin's (2010) study, they strongly believe that sustaining quality of TVET at secondary school level is very important to ensure a balance development of social, environmental and economic development in Malaysia. In addition, the revamp of TVET as outlined in the Malaysian Education Blueprint 2013-2025 is specifically focusing secondary schools, especially in enhancing the quality of training in vocational college (MOEM, 2012). Therefore, there is a need to develop an industry-based technical communication pedagogical model as it is beneficial to develop technical communication skills and in turn will help to further enhance the 'mental' and 'manual' elements that are relevant to the industry (Jessup, 1991). In achieving this, the very step is to develop a pedagogical model that considers the views of the industry and TVET experts as well as vocational education practitioners, with reference to relevant literature as the foundation, especially on the best practices of technical communication courses. This is because, teachers play a prominent role to the success of instilling technical communication skills in TVET institutions. Marsh and Willis (2007) explained that the curriculum implementers, the teachers- are the prominent agent in realizing the planned objectives and aspirations of a curriculum. They added that the planned curriculum is viewed as an abstract document, and thus, teachers' understanding, and knowledge should be given a major emphasis in ensuring a successful implementation. This calls for a development of a clear and comprehensive pedagogical model for teachers. According to Batista, Behar and Passerino (2010), pedagogical model is the presentation of theories relevant to the field of learning, which provides a clear guideline of how to implement the curriculum at the micro level. In the context of the development of technical communication skills, there is a need to focus on the development of the pedagogical model as the current practices of technical communication across different TVET institutions are still in disperse (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Laverty, 1979; Marshall, 1982; Nutman, 1987; Reaves, 2004). A comparison on its practice- the objective, learning content, delivery method, and assessment (further discussed in Chapter 2) has noted that the interpretation of what is technical communication and its important elements for teaching and learning is different due to the different skills needed by the industry. Thus, to implement a sound pedagogical model in the Malaysian context requires an in-depth exploration of what is needed by the local industry and should be supported with the academic experts' view in ensuring an effective implementation in Malaysia.

Conceptual Framework

For this study, relevant theories and frameworks have been reviewed and a very broad conceptualization is presented in Figure 1.1below. In the previous section, the issues that have plagued the implementation of technical communication in TVET institutions have been presented. It has been argued that there is still a mismatch between the industry needs and the outcomes of the TVET (Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997). In the current landscape of its practices, the underpinning literacies in technical communication and its delivery method were viewed and implemented differently across different TVET settings. However, that does not mean that the current study is ought to seek its common characteristics to be generalized in the localized context of Malaysia. Ross (2000) has emphasized that such generalization is very doubtful because the industry needs and educational aspirations of one country is different to one another. Hence, the current study is based on this belief and is set to investigate the needs of teaching of technical communications- the objectives/focus of learning, content of learning, method of delivery, and assessment method, in Malaysian Vocational Colleges.

Firstly, within limited literature on technical education in Malaysian context, most of these studies focused on the employability skills (Azian & Mun, 2011; Rahmah et al, 2011; Rasul, Ismail, Rajuddin & Rauf, 2010; Zubaidah & Rugayah, 2008) and evaluated the current TVET programmes (Ibrahim et al., 2012; Yunos et al., 2006) and some studies have explored relevant elements for Malaysian TVET frameworks (Minghat & Yasin, 2010; Yunos et al., 2006). What seems to be relevant to the current study is the sustainable development framework for TVET in Malaysia (Minghat & Yasin, 2010), where communication was found to be one of the prominent elements in this framework. Other relevant elements from this study include the teaching methods, knowledge, competency-based training, and industrial relations and internship. These elements reflect Wellington's (1993) description of what is needed in an industry-based curriculum. Linking these findings to the current study, these elements are used as the foundation to further explore the best practice to introduce technical communication in Malaysian Vocational Colleges.

In designing the pedagogical model, Tyler's (1949) curriculum planning model is found to be relevant in guiding this process. There are four phases in curriculum design, which includes outlining objectives, selecting learning experience, organizing learning experience, and evaluating pedagogical model.

As appointed by Tyler (1949), the first phase is to outline the objectives. For the purpose of the current study, Wellington's (1993) framework of an industry-based curriculum is also used. The general objective of this pedagogical model is to propose an industry-based technical communication skills pedagogical model for Malaysian

Vocational Colleges. Since the mismatch between industry needs of technical communication and the outcomes of TVET institutions (as presented in the previous section) and the different representations of content of technical communication learning, were highlighted in the literature, this study seeks to identify the elements required by the industry and merge them into technical communication pedagogical model. Hence, the main emphases of this pedagogical model are to develop: a) the relevant content of the curriculum (the literacies and skills related to technical communication) to the industry needs, b) effective methods of delivery, c) relevant assessment measures, and d) suitable teaching and learning settings for Malaysian Vocational Colleges, which in turn will introduce students to personal and social component, and work-related activities during the teaching and learning phase, as suggested by Wellington (1993).

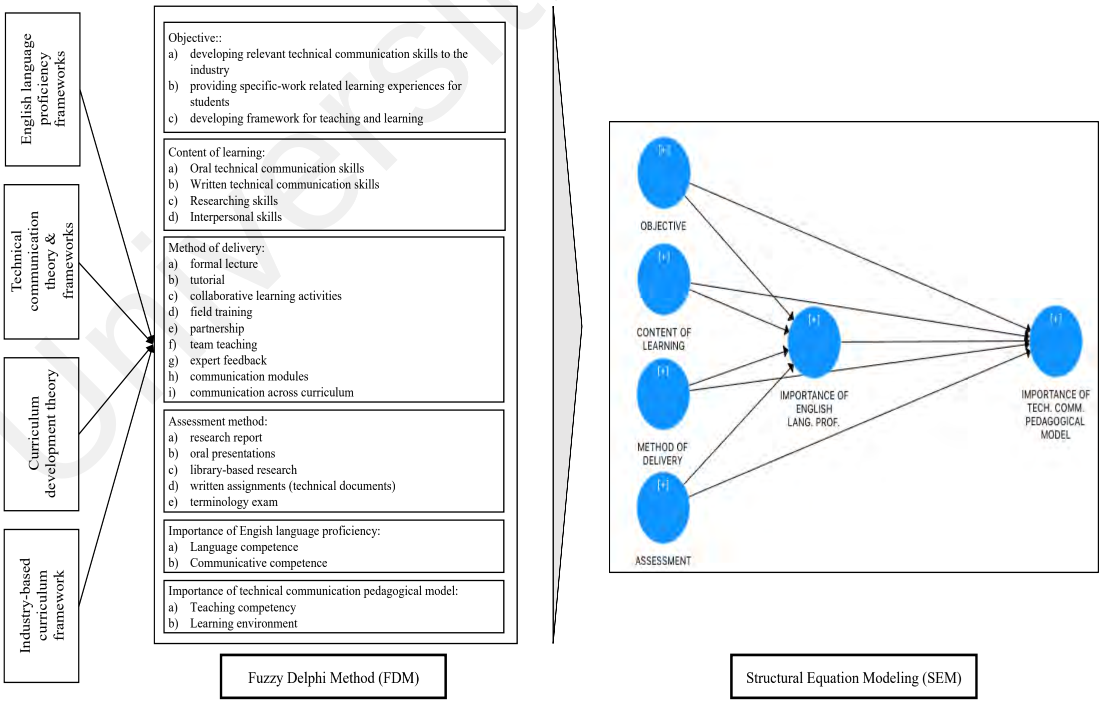


Figure 1.1 The conceptual framework of the current study

In achieving this, an extensive review of literature is first conducted. From this, possible key determinants of the model are identified. This is followed by fuzzy delphi with 17 experts (from industry and TVET institutions) in determining the relevant key determinants for the context of Malaysian Vocational Colleges. The experts' opinions are very important for the current study as the issue of poor interaction between TVET curriculum developers, industry experts and TVET instructors has been reported as an impediment to development of technical communication skills (Reaves, 2004). Hence, the experts' opinions and suggestions are considered to set foundation for the model development. Later, survey instrument is developed and administered on 205 English language instructors in Malaysian Vocational Colleges. The final outcome of this study is the model that serves as a reference for implementation in developing technical communication skills for students in Malaysian Vocational Colleges.

Research Objectives

In this study, the main objective is to propose technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges. The study is aimed to achieve the outlined objectives below:

Phase 1: Needs analysis

1. Identifying the key determinants of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges from industry and TVET experts' perspectives.

Phase 2: Model development

1. Proposing technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges.

2. Evaluating the effect of English language proficiency on the development of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges.

Research Questions

Given our main research objective- to propose technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges– the study seeks to answer the research questions below:

Phase 1: Need analysis

1. What are the key determinants of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges from industry and TVET experts' perspectives?
   a. What is the prominent objective for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?
   b. What is the prominent content of learning for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges
   c. What is the prominent method of delivery for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?
   d. What is the prominent assessment method for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

e. What is the prominent English language proficiency skills for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

f. What is the perceived importance of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

Phase 2: Model development

1. What are the pertinent elements of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges according to English language vocational college instructors?

a. What is the effect of the pertinent objective on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

b. What is the effect of the pertinent content of learning on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

c. What is the effect of the pertinent method of delivery on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

d. What is the effect of the pertinent assessment method on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

e. What is the level of coefficient of determination, effect size and predictive ability of all pertinent components of curriculum to predict technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

2. What is the effect of perceived importance of English language proficiency on the relationships of all pertinent curriculum components to predict technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?

Research Hypotheses

In this study, the proposed pedagogical model was tested based on the null hypotheses below:

a) Hypothesis 1_0 ($H1_0$): The pertinent objective has no positive and significant effect on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges

b) Hypothesis 2_0 ($H2_0$): The pertinent content of learning has no positive and significant effect on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges

c) Hypothesis 3_0 ($H3_0$): The pertinent method of delivery has no positive and significant effect on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges

d) Hypothesis 4_0 ($H4_0$): The pertinent assessment method has no positive and significant effect on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges

In addition, to test the mediation effect for the proposed model, the null hypotheses are:

a) Hypothesis 5_0 ($H5_0$): The relationship between pertinent objective and technical communication pedagogical model for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is not positively mediated by English language proficiency.

b) Hypothesis 6_0 ($H6_0$): The relationship between pertinent content of learning and technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is not positively mediated by English language proficiency.

c) Hypothesis 7_0 ($H7_0$): The relationship between pertinent method of delivery and technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is not positively mediated by English language proficiency.

d) Hypothesis 8_0 ($H8_0$): The relationship between pertinent assessment method and technical communication pedagogical model for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is not positively mediated by English language proficiency.

Significance of the Study

One of the major strengths of this study is its focus to help improve the technical communication skills as early as secondary education level. As described earlier, the complexity of the poor mastery of communication skills has resulted in a major skill gap across industry and has affected TVET institutions' status and credibility (Mourshed, Patel & Suder, 2014; Nagendra, Radha & Naidhu, 2013; Oxtoby, 1997; Tabbron & Yang, 1997). The findings of this study are to:

a. provide a pedagogical model to help improve the quality of technical communication skills development among Malaysian Vocational Colleges, in realizing our national education aspirations as presented in our Malaysian Education Blueprint 2013-2025; to help students to achieve their full potential, and "...to be able to work effectively…" (MOEM, p.66, 2012).
b. provide an alternative to poor quality education and training, especially in expertise and industry-recognized curriculum (Ministry of Education Malaysia, 2012) to support the production of skilled workers in future.

In previous section (Statement of Problem), a detailed discussion on the importance of developing technical communication has been presented with support from the literature. Motivated by the significant importance of communication skills to enhance employability skills among TVET graduates, developing technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is very crucial. Within the localized context of poor employment in Malaysia (increasing unemployment rate among secondary and tertiary education graduates) and in full alignment to the Ministry of Education Malaysia's aspiration to produce more skilled workers for future (MOEM, 2012a) who are able to communicate professional knowledge and perform work-related tasks effectively (MOEM, 2014). Hence, the very step is to provide a string foundation of technical communication among students in Malaysian Vocational Colleges. The main strength of the current study is the proposed pedagogical model that is aligned with an industry-based curriculum. Prominent elements of an industry-based curriculum (based on Wellington's (1993) theory) and technical communication skills clusters (derived from the review of the literature) are combined in proposing the pedagogical model. The underpinning principles of selecting a pedagogical model are derived from the belief that there is an unclear direction on how to improve communication skills in TVET institutions (Nagendra et al., 2013), uncertainties on what sub skills to be introduced and develop in technical communication course (Reaves, 2004), and the relevant teaching and learning components (learning objectives, method of delivery, content of learning, and assessment method) to be implemented in this course.

Thus, the development of pedagogical model is selected not only because its exclusive functions in translating relevant learning theories into teaching and learning guidelines for practitioners (Batista et al., 2010; Husin & Aziz, 2004; Watkins & Mortimore, 1999) but also its ability to serve as a platform to harmonize researchers and practitioners' views on prominent focus and content for teaching and learning (Watkins & Mortimore, 1999). In addition, Husin and Aziz (2004) have clearly mentioned that developing a sound pedagogical model will simultaneously contribute to the development of students' knowledge and performances. They further explained this belief by referring to Glaser's (1962) instructional model, where a sound pedagogical model should consider the overall process of learning; starting with establishing learning objectives to understanding students' "entry behaviours" and designing instructional procedures, and finally assessing their performances in learning. Based on this stance, the current study makes a relative contribution not only to the inadequacy of literature in the practice of an effective technical communication but also serves as a reference to improve poor communication skills among students in TVET institutions.

Even though, the expected outcomes of the current study are restricted to Malaysian Vocational Colleges context, much can be learned from the proposed pedagogical model. As aforementioned, the current body of literature only reports on different practices of technical communication courses across the globe. A review of literature in this area from 1979 to 2015 has provided the sub skills for components in technical communication course, such as the content of teaching and learning of technical communication courses (Brinkman & van der Geest, 2003; Burganova & Valeev, 2015; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Rus, 2014), integration of interactive learning platform in technical communication courses (Kunioshi, Noguchi, Hayashi & Toio, 2012; Marshall, 1982), methods of delivery (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Reaves, 2004), evaluation of the overall course (Burganova & Valeev, 2015; Ibrahim et al., 2012), and assessment measures in technical communication courses (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane & Gibson, 1997; Laverty, 1979; Marshall, 1982; Nutman, 1987; Reaves, 2004; Yu, 2012). What is needed is the next direction of how to integrate industry needs with the development of technical communication in TVET institutions. Hence, one of the contributions of the proposed model is to serve as a guideline for curriculum developers, to design the training required for teaching and learning of technical communication skills in an industry-based curriculum.

The current study provides a promising opportunity to help address the poor implementation of technical communication skills development in TVET institutions. Even though the study focuses on Malaysian Vocational College settings, the findings of this study can be served as a reference point to further understand and consider potential elements to technical communication development. Firstly, the foundation of this study is developed from an extensive review of literature, mostly from international context, as well as local experts' opinions on relevant elements to this model. Other than curriculum components, the study has highlighted the importance of ELP as part of technical communication skills development, which is one of the important factors to enhance employability (Bleakley & Chin, 2004; Chiswick & Miller, 2014; Hošková-Mayerová, 2014). In short, the current study has provided a possible direction to effectively implement technical communication courses for TVET institutions. However, to simply generalized the proposed model for technical communication skills development in other TVET institutions should be avoided.

Operational Definition

In this section, it provides the operational definition for the key terms of this study. The definition is derived from the relevant literature in the field of technical communication in TVET settings.

Industry-based curriculum

An industry-based curriculum has four general characteristics. According to Wellington (1993), this curriculum has:

a. specific targets and programmes that reflect the aspiration of the National Curriculum and the field of word;
b. guiding framework in determining the knowledge, understanding and skills in preparing students for economic and industrial understanding, and careers education guidance;
c. specific focus in developing personal and social skills that are relevant to the world of work;
d. Integration of specific work-related activities and field experiences that helps to familiarize students with the field of work.

In this study, these four elements are to be considered as the foundation in developing the pedagogical model. In addition, Ross's (2000) outlines for curriculum development is used to set foundation in proposing the pedagogical model. This includes selecting the content, delivery method, and assessment measures in evaluating the outcomes of the learning. Therefore, in developing the pedagogical model, these elements are integrated with reference to the current literature.

Technical communication skills

Technical communication is a strategic communication that has defined purposes and context in delivering information to a specific audience (Rus, 2014). It is relevant to state that technical communication shares the characteristics of English for Specific Purposes (ESP). In an earlier work of Strevens (1988), he described ESP based on 'absolute characteristics' and 'variable characteristics. Generally, the 'absolute characteristics' of ESP concern on the teaching and learning of ESP subject. Central to learning, ESP focuses on learners' specific needs, and the contents of learning are designed around this (such as occupational needs or academic disciplines). Very exclusively, ESP does not primarily focus on developing language proficiency. Rather, it is embedded through the learning activities, which is described as one of the 'variable characteristics' of ESP. Very specifically, technical communication considers these characteristics and has expanded them into organizing and structuring communication skills and literacies that are relevant to technical field (Brinkman & van der Geest, 2003; Laverty, 1979; McMurrey, 2002; Nutman, 1987). In fact, many researchers agreed that the teaching and learning for technical communication course are driven by communicative needs of the industry (Brinkman & van der Geest, 2003; Cook, 2002; Lappalainen, 2010; Laverty, 1979; Nutman, 1987; Reaves, 2004; Rus, 2014). In short, technical communication covers:

a) interpersonal skills;

b) researching skills;

c) technical writing skills;

d) oral technical communication skills.

In this study, the development of technical communication pedagogical model considers all courses that are offered in the vocational colleges. According to Tabbron and Yang (1997), one of the most demanding skills in the industry is communication skills. Specifically, Tabbron and Yang (1997) referred communication skills as a set of skills that are transferrable across different technical fields. Based on the review of the literature, researchers have agreed that technical communication skills that encompass interpersonal, researching, technical writing and oral technical communication skills are very relevant to the technical field (Brinkman & van der Geest, 2003; Cook, 2003; Lappalainen, 2010; Rus, 2014). In fact, in Mitchell's (1962) work, he has highlighted the importance of these skills across "…all fields of science and engineering, and to an industrial society." (p.1). Based on this belief, the current study is aimed to not only proposed the direction of how to conduct teaching and learning of technical communication in Malaysian Vocational Colleges but also to serve as a foundation to develop relevant skills that are relevant to the industry. The current study holds to the belief that an industry-based curriculum is a relevant platform to match the needs of industry with the outcomes of technical education. In achieving this, the industry and TVET experts, along with English language instructors in Malaysian Vocational Colleges are the participants of this study.

In the current practice of the General English subject across the Malaysian Vocational Colleges, it is found that this course is designed to suit all technical courses as it has made compulsory to all students. The aim of this subject is to develop a strong foundation of communication skills among the students in order to produce future workers who are competent in communicating professional knowledge and performing work-related tasks efficiently (MOEM, 2014). However, it is found that within the limited time frame of teaching, due to the ratio of learning for academic component (30) to practical skills (70), there is a need to develop an organized guideline for teachers in teaching this subject. In fact in the current practice of this subject, there are a number of weaknesses found in the focus and content of the subject (refer Chapter 2: The relationship between General English and Technical Communication skills section), especially on the mismatch between the highlighted skills in the subject with the relevant skills of communication required by working field. Hence, it is hoped that the proposed pedagogical model is not only able to bring forward the "generalizable" skills as highlighted in Tabbron and Yang's (1997) study in the teaching and learning, by aligning the local experts' perspective on the best focus of learning, method of delivery, content of learning and assessment for students' learning in Malaysian Vocational Colleges.

Vocational colleges

Vocational colleges refer to vocational education practices in Malaysia. In the current landscape of TVET in Malaysia, MOEM (2012) has state that the vocational education has been introduced as early as lower secondary level. Vocational colleges offer different certifications such as Malaysian Skills Certification (*Sijil Kemahiran Malaysia*, SKM) and diploma certification for students. At the moment, there are approximately 81 vocational colleges in Malaysia. Hence, the current study proposes technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges.

Limitations of the Study

Generally, the current study seeks to propose technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges. The definition and scope of technical communication in this study should be treated with cautious. Based on the review of literature (in Chapter 2, the "Technical Communication", "Technical Communication based on the theories, models and Communication Process model" section), the skills covered in Technical Communication course covered four major clusters of skills, which are: a) interpersonal skills, b) researching skills, c) technical writing skills, and d) oral technical communication skills. These skills are formed based on the industry needs for communication. For this study, these skills are verified with the TVET and local industry experts in order to frame the relevant communication skills to the localized context of Malaysia (refer Chapter 3 for detailed methodology). Hence, the proposed pedagogical model is restricted to Malaysian vocational context only. This is because the TVET and industry experts are asked to determine the prominent elements of the model in the context of Malaysian Vocational Colleges. This valuable information is used to develop the pedagogical model. Therefore, the findings of this study are not generalizable to other TVET institutions.

In addition, because of the General English subject is being introduced to all courses in Malaysian Vocational Colleges, it is important to note that the proposed pedagogical model considers technical communication skills across all courses. This is because, in the current practice of English language subject across vocational colleges, the General English subject is a compulsory component in all colleges, which is aimed "..to improve students' language competence as well as communicative skills" (MOEM, p.2, 2014). In fact, the English language instructors teach similar content of this subject to all courses. However, this does not mean that the proposed pedagogical model is for general English language development. Considering the exclusive characteristics of technical communication (as proposed in Mitchell's (1962) work, and expanded in other studies, such as in Brinkman and van der Geest, (2003), Cook (2003) Lappalainen, (2010) and Rus, (2014)), the clusters of skills of technical communication in this study are therefore more refined based on the local industry needs and TVET experts' opinions, which are relevant to be practiced to improve the weaknesses of the General English subject in the Malaysian Vocational Colleges. Again, the findings of the current studies are only applicable and restricted to Malaysian Vocational Colleges.

Secondly, the available literature to base this study is mostly from the different TVET context such as in the United States of America, United Kingdom, Canada, and Finland. The literature on technical communication in the localized of Malaysia is quite limited. Hence, this might affect the overall findings of the study. However, in dealing with this issue, the proposed instrument and model are statically tested. A detailed process of validation of these items is further discussed in Chapter 3. In short, it is hoped that the findings of the current study benefit multiple parties, especially the policy makers and educators, in order to improve the quality of TVET graduates for the future.

Conclusion

In short, this study is to develop technical communication pedagogical model, that is closely related with the concept of industry-based curriculum. As discussed earlier, the issue of poor mastery of communication-for-work skills has affected employability of TVET graduates. Even though introducing technical communication is highly potential, it has been established that poor interaction between TVET curriculum developers, instructors and industry has resulted in poor implementation of technical communication in the current TVET institutions. Hence, the current study is designed to identify the relevant key determinants of this model from perspective of TVET experts, industry and English language instructors in Malaysian Vocational Colleges.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter presents an in-depth discussion on the theories, frameworks, and relevant literatures and practices of technical communication in TVET settings. In the final section, the landscape of TVET in Malaysia is presented and discussed in greater detail.

Key Determinants of Technical Communication Pedagogical Model

Technical communication has been viewed as an alternative to develop work-related competencies among TVET students. It has been argued that general communication scheme is inadequate to represent work-related communication competencies need by the industry (Lappalainen, 2010; Rus, 2014). The general communication scheme generally discusses the roles of encoder, channel and receiver of the information, but has overlooked the roles of individuals, their professional characteristics, and special features and context of the communication in an authentic work-related communication setting. Similarly, Lappalainen (2010) expressed that TVET institutions should provide students beyond English language competency. The current demands require students to be competent in generic, professional skills, and interpersonal communication skills, relevant to the technical field. Other studies such as Brinkman and van der Geest (2003), Kunioshi, Noguchi, Hayashi and Toio (2012), Laverty (1979) and Reaves (2004) firmly agreed that technical communication is prominent in dealing with incompetency of current communication scheme.

In agreement to the above discussion, Wellington (1993) has deliberately discussed the employers' expectations of the vocational schools' graduates. He presented the findings of the Secretary's Commission on Achieving Necessary Skills (SCANS) (1991) study, on the competencies and foundation of preparing students for the workplace, as illustrated in the Table 2.1 below.

Table 2.1
Workplace-school competencies and foundation skills

Competencies
Resources: allocating time, money, materials, space, and staffs.
Interpersonal Skills: working in teams, teaching others, serving customers, leading, negotiating, and working well with people from culturally diverse backgrounds.
Information: acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information.
Systems: understanding social, organizational, and technological systems, monitoring and correcting performance, and designing or improving systems.
Technology: selecting equipment and tools, applying technology to specific tasks, and maintaining and troubleshooting technologies.
The foundation
Basic Skills: reading, writing, arithmetic, and mathematics, speaking and listening.
Thinking Skills: thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn, and reasoning.
Personal Qualities: individual responsibility, self-esteem, sociability, self-management, and integrity.

Source: Wellington (p.83,1993)

Interpersonal skills are viewed as one of the important competencies to be acquired by vocational students before entering the work field. Wellington (1993) explains that these skills cover: a) working in teams, b) teaching others, c) serving customers, as well as d) leading, negotiating, and working well with people from culturally diverse backgrounds. In order to achieve these competencies, the basic skills must first be developed. He explained that literacy, arithmetic and mathematics, as well as speaking and listening serve as a fundamental foundation that helps vocational students to work and function effectively in the work field. It is very apparent that the emphasis on technical communication has been deliberately given in producing a well-equipped individual in future work field. In fact, Male, Bush and Chapman (2011) firmly believe that competencies in the technical field are interrelated. The skills or cluster of skills learned from one discipline to another have a relative contribution to work field preparation. They further quoted the Organisation for Economic Co-operation and Development's (OECD, 2002) definition of work-related competency, which emphasizes that competencies are: a) interrelated, b) closely related to its context, c) influenced by stakeholder's selection, and d) constantly related to its outcomes. Therefore, the skills presented by Wellington (1993) in workplace-school related competencies can be viewed as a set of integrated skills that are depending on the needs of the industry and its translation in the TVET curriculum.

In a separate literature, other researchers have termed the communication skills under the workplace-school competencies and foundation skills, as technical communication (Reaves, 2004; Rus, 2014). Reeves (2005) defines technical communication as a strategic communication that has defined purposes and is influential on the audience. Rus (2014) extended this definition by relating a specific social context- the professional environment, as the influential determinant of the forms, context and purpose of the communication. As mentioned earlier, Rus (2014) has specifically compared technical communication to general communication. The general communication scheme only emphasizes on encoder and decoder of the communication. On the other hand, technical communication does not only emphasize on encoder and decoder of the communication, but exclusively focuses on audience and its relationship, context, and the multitude of purposes of communication. In Khoshnodifar, Ghonji, Mazloumzadeh and Abdollahi's (2016) study, technical communication is viewed as the influential determinant of success in business field. They agreed that technical communication skills, which include negotiation and information exchange between networking agencies, and professional relationship between companies, are influential to the success in working field.

In short, it is relevant to state that technical communication does not contradict the general communication scheme but improvising its inadequacy to represent communication in technical field. It has been established that technical communication focuses on additional elements of communication for work (specific communication purposes, content and context, and roles of the speakers). As presented by Wellington (1993), communication skills for work cover not only interpersonal skills but also the ability to serve customers, lead a team, as well as interpreting and communicating data at work. Linking this to the issue of poor communication skills among TVET graduates and its effect on unemployment (in global and local settings), it is relevant to state that developing technical communication skills among TVET students is potential to equip students with a strong foundation of communication skills in authentic working settings.

Forms of Technical Communication

Previously, it has been established that technical communication is specifically used to convey message or information to specific audience, and with specific purposes. The world of technical and scientific field requires workers to be equally competent in both oral and written communication. By now, we are well aware that these competencies are equally prominent for future work field as the acquisition of these skills seem to be lacking among most TVET graduates across the globe (Mourshed, et al., 2014; Nagendra, Radha & Naidhu, 2013; Oxtoby, 1997; Tabbron & Yang, 1997). For instance, Mourshed et al. (2014) specifically mentioned that oral and written communication skills are lacking and thus affect employability of TVET graduates.

In the work of McMurrey (2002), he similarly defines technical communication as communication based on its purposes (which is to communicate technical information for specific purposes), targeted audience (communication in workplace setting) and forms of communication (which focus on the selection of effective channels or tools to communicate information).

Clearly, McMurrey's (2002) definition agrees with Rus (2014) and Wellington's description of workplace-school competencies and foundation skills, which concerns on importance of having a good interpersonal, social, information and working-in-team skills. However, McMurrey's (2002) work has extended this definition by proposing detailed descriptions of forms of technical communication-oral and written communication. Before drawing on the detailed descriptions of these two forms of technical communication, it is significant to understand the elements of technical communication. There are eight elements that include:

a. communication,

   Communication in technical field is broad. McMurrey (2002) describes it as process of conveying information through various means, such as words, pictures, sound, animation and video.

b. technical,

   McMurrey (2002) does not restrict the word 'technical' as computers and electronics. Instead he proposes 'technical' as "…a body of knowledge, any craft or expertise not commonly understood." (p.3). This exceeds any fields and discipline.

c. information,

In the context of technical world, McMurrey (2002) describes information as details, functions or concepts of a product. Information is retrieved from various sources, such as user guide, manuals, reports and even business letters and memos.

d. specific purpose,

The information conveyed is pitched to achieve specific purpose. In the technical field, McMurrey (2002) believes that information is presented or conveyed to inform, instruct or persuade audience.

e. specific audience,

Technical communication is not only pitched for individuals in this field. McMurrey (2002) mentions that the audience of technical communication includes 'ordinary people'. They are the targeted audience if they are relevant and have importance to the product or information conveyed.

f. needs,

Similar to above point, audiences of technical communication "…have specific needs for infomartion." (McMurrey, p.3,2002). Typically, their needs are basically on the information on the products, which includes the background information, its structure and functions, operating systems, and some recommendations in selecting a suitable product.

g. specific situation,

In this case, McMurrey (2002) describes it as a framework used in the written form of communication. The information needs to be relevant and address professional, business and industrial applications. It can be either a solution to a problem, fulfilling needs, or opens up opportunities. However, this is still depending on the specific purpose, audience and needs of the related individuals.

h. tools,

Tools refer to methods of technical communication. McMurrey (2002) highlights that the information can be presented in various forms, either online, print or on screen. Again, the selection of tools is related to other elements mentioned above.

Based on the above description, these characteristics (communication, technical, information, specific purpose, specific audience, needs, specific situation, and tools) can be represented into two forms of technical communications: written and oral.

Written technical communication. The functions of technical texts are not only restricted to conveying information. Earlier, it has been presented that other functions include informing, instructing or persuading audience. In fact, in the work of Reaves (2005) and Rus (2014) have similarly appointed its importance and linked it to specific purpose and audience in a communication setting. In a detailed description of written technical communication, McMurrey (2002) has proposed nine types of technical texts, which are research reports, user guides, online helps, technical-support writing, reference information, consumer literature, consultant technical writing, marketing literature and technical journalism. These nine types of texts can be categorized into two main categories: technical reports and proposals, and informative documents for consumers, as presented in Figure 2.1 below:

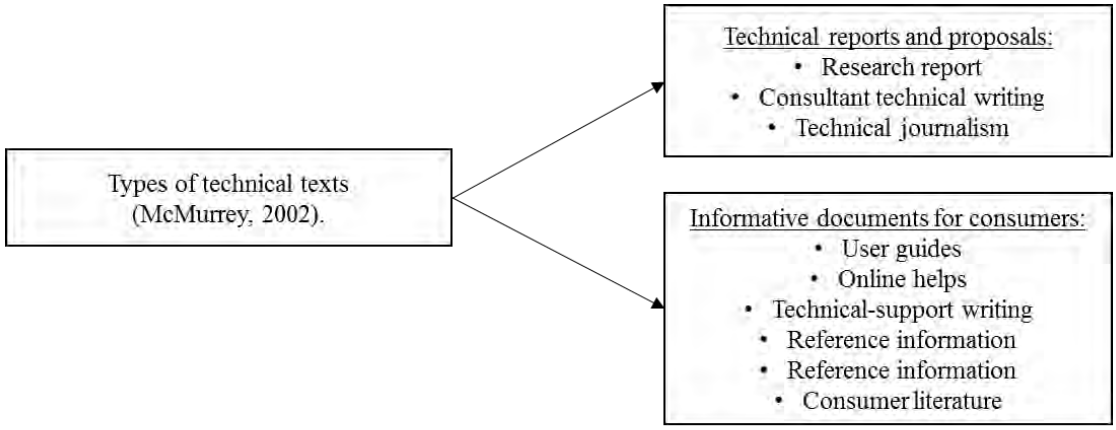


Figure 2.1 Types of technical texts (McMurrey, 2002).

Basically, the technical reports and proposals are used to report findings of a specific technical project. McMurrey (2002) further elaborates that the research report as an 'emotionless' text that present findings of a technical research. In addition, technical journalism is an academic form of technical reports that present information of an invention, idea, new product and relevant issues to technical field. In addition, consultant technical writing is also used to present findings of a project. It is used by consultants in presenting their works, such as project proposals and feasibility reports.

On the other hand, the informative documents for consumers are generally used to inform users about the product. For instance, user guides provide step-by-step instructions for users in order to operate a new product or innovation. Similar to that, 'online help' serves short reminders and guidance for users to operate an online system or programme. McMurrey (2002) added that technical-support writing also falls in the same category. This document also provides information on how to operate and troubleshoot a new product. However, the only difference is that this document is uploaded to database for users to retrieve easily. Furthermore, consumer literature is used to convey information to the mass. McMurrey (2002) mentioned that this type of document is usually used by the government or non-profit organizations to convey technical information on environmental issues and public safety. Also, another form of text that falls in this category is reference information. It refers to a document that presents the settings, features, modes and effects of a product. McMurrey (2002) describes that this type of document is usually presented in 'encyclopedia-style', where the information is presented alphabetically. Lastly, marketing literature is a document that promotes an invention of product to public or relevant parties, in form of brochures and product specifications.

In another literature, Mitchell (1962) presented written communication in a slightly different manner. He divided technical written communication into three major groups: a) technical descriptions and instructions, b) reports and articles, and c) correspondence.

Mitchell (1962) defines 'technical descriptions and instructions' as a form of writing that has "…a clinical objectivity and a completely predictable pattern" (p.6). Generally, Mitchell (1962) added that these texts provide information in an organized manner in ensuring the targeted audience has a complete understanding. These texts are represented in Figure 2.2 below:

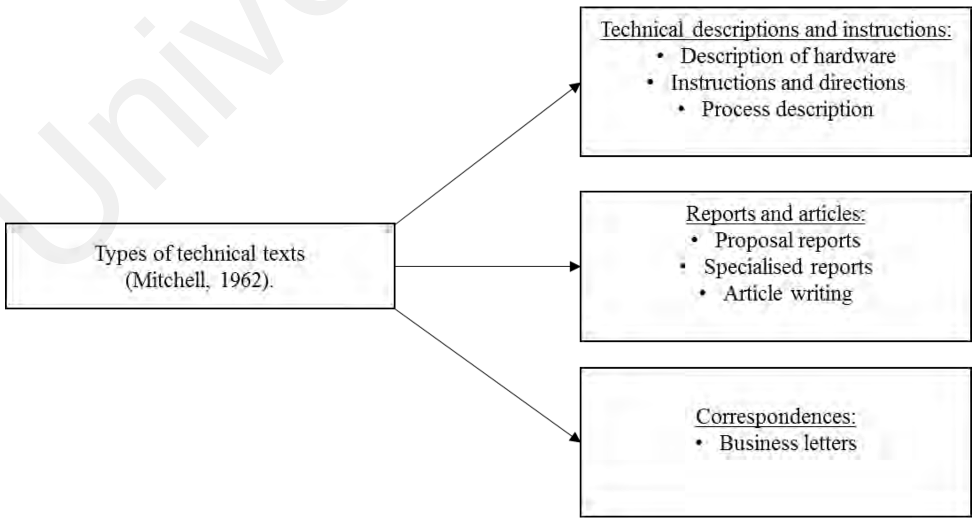


Figure 2.2: Types of technical texts (Mitchell, 1962).

In the first category, the technical descriptions and instructions, the texts that fall in this category are aimed to provide descriptions of a product and instructions to operate it. Specifically, Mitchell (1962) explained that the description of hardware text provides information on the physical descriptions and functions of every feature of a product. This document is helpful to introduce a new invention to consumers. Secondly, instruction and directions, and process description text shares a similar purpose, which is to provide information on how to operate an object. However, Mitchell (1962) noted that instruction and directions text provides more detailed instructions for consumers. This is relevant if the invention is new and unfamiliar to customers. Therefore, this text provides comprehensive and detailed instructions, and assumes that the consumers are untrained in technical field.

In the second category, reports and articles, Mitchell (1962) noted that texts such as proposal reports, specialised reports and article writing are generally used to present information on findings of a study, which concerns on solving technical issues. For instance, proposal reports are used to present the possible solutions to a problem, which have been tested in the technical field. Specialised reports also share this characteristic. The only difference between both texts is the specialised reports are used to convey specific information to specific audience, such as memorandums and labouratory reports. Lastly, article writing also falls in this category. According to Mitchell (1962), this text is also used to address issues and solutions in technical field. However, this type of text is categorised as scholarly articles and thus, the form and style of writing are slightly different from the other texts. Mitchell (1962) added that this text provides industrial and scientific progress of the respective field.

Finally, in correspondence category, Mitchell (1962) defined business letters as a piece of formal writing that is used to convey important information on the product, production, specification and other relevant information. This also includes application letters, data sheet, and recommendation, complaint and transmittal letters, that are typically used in technical field.

The description provided above covers the forms of written technical communication that is relevant to the technical field. Within these broad examples of written texts, it is important to introduce and train TVET students to be familiar and competent in producing such texts. Mitchell (1962) justified that industry practitioners spent most of their professional time using and producing technical written texts. In fact, in the current research presented by Burganova and Valeev (2004), they similarly agreed on this matter.

However, in the current industry settings, the demand for skilled workers with a strong technical writing skill is arising. In a recent large-scale study by Mourshed et al. (2014), it is found that technical writing skills are among the largest skills gap for the public service. With the rapid advancement of technology, Tabbron and Yang (1997) found that technical communication skills should be intensified to match the demand of the industry. Therefore, it is relevant to look deeper than developing students' knowledge on the types of technical texts. For instance, in a number of studies such as in Brinkman and van der Geest (2003) and Cook (2002) have suggested key literacies for technical writing skills. Brinkman and van der Geest (2003) suggested that in developing technical writing skills, students should be equipped with text craftsmanship skills. This means that technical writing skills should be developed together with critical writing skills. In their study, they suggested that the ability to build logical arguments, recognize style variations (language and style of writing to suit target audience), differentiate different text conventions (such as layout for report and journal articles) and research relevant information and resources are very important to technical communication skills development. Similarly, Cook (2002) emphasized the importance of critical literacy (which refers to ability to conceptualize writing with supporting evidences) and rhetorical literacy (which refers to ability to understand the audience and to produce suitable texts for their level) are very important to the development of technical writing skills. Therefore, in developing technical writing skills, the focus should be given on students' ability to produce critical writing through in-depth analysis of relevant resources and a deeper understanding of the targeted audience of the text. As the result, the students will not only be able to differentiate different types of technical texts but are also critical in their writing to suit the audience and purpose of the text production.

Oral technical communication. Researchers agreed that oral communication is one of the communication skills required to help preparing TVET students or graduates for their future work (Burganova & Valeev, 2004; Mourshed, et al., 2014; Rus, 2014). Generally, in technical field, Mitchell (1962) describes that the tone of communication is as a professional. In this case, Mitchell (1962) further describes that an industry expert must have a strong knowledge foundation of his or her field of expertise and be prepared to present or defend his or her own professional opinions. In the work of McMurrey (2002), he proposed an outline for planning an oral presentation. He presented the planning process as illustrated in Figure 2.3 below.

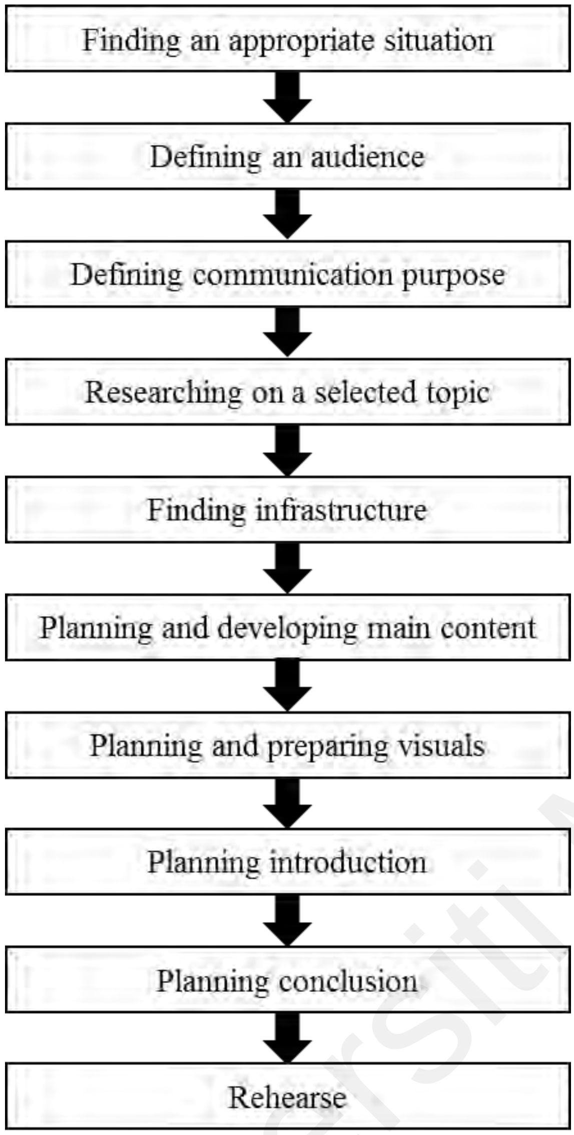


Figure 2.3 The planning process in oral technical communication.

Mitchell (1962) described that in the first phase, finding an appropriate situation, analysis of existing technical reports and brainstorming process will take place to establish the purpose of an oral presentation. The analysis is a crucial part, where issues in the working field will be identified and possible recommendations from the existing reports will be derived as a point of discussion. The group discussion or brainstorming will further help to deepen the understanding of a particular issue. Next, in defining the audience, the target audience will be analyzed. This means that the audience' level of understanding and familiarity of the issue will be considered in preparing the content of the presentation. Rus (2014) noted that understanding target audience is a distinctive characteristic of technical communication compared to general communication theory that in turn will influence the oral presentation style. In the next stage, the process of defining communication purpose will take place. Mitchell (1962) noted that this process is critical in deciding the expected output of the presentation. The presentation can either be persuasive, instructing, refuting or proposing new ideas to the audience, depending on the purpose of the presentation. In realizing the selected purpose of an oral presentation, a speaker should research on the selected topic. This process includes data gathering, data analysis and interpretation. For instance, if the purpose is to propose a new idea, relevant information on its importance, possibility of success as well as its contribution should be gathered to support the presentation. In doing this, Mitchell (1962) added that the speaker should be able to find relevant infrastructure to present the content. He noted that a presentation can either be a brief description of an idea or presenting cause and effects of the proposed idea. In the next stage, the information will be organized and included in the main content of a presentation. In achieving this, a speaker should be able to simplify complex information or content to suit the audience. Also, Mitchell (1962) suggested that the use of visuals to support the presentation. Graphics and videos are among typical visual aids used to help ease the comprehension. Next, a speaker should be able to plan the introduction and conclusion to his/her presentation. For instance, in the introduction of the presentation, the salutation and purpose of the presentation must be clearly presented. Mitchell (1962) mentioned that a good introduction must provide some background information of an issue and supportive details to describe it. In addition, in the conclusion of a presentation, a speaker should be able to conclude the overall presentation and reinforce his/her points. Therefore, a meticulous attention should be given on how to reinforce the main purpose of the presentation starting from beginning to the end of presentation. Lastly, Mitchell (1962) advised speakers to rehearse the overall presentation in order to build confidence and fluency of presentation.

Mitchell (1962) has established that oral technical communication includes three forms of communication, which are:

a. speeches,

   In delivering a speech, an individual must first be an expert of his or her field. Mitchell (1962) describes that the content of the speech must be factually relevant to the field of expertise. Also, a speaker must be aware of the time and place of the speech. These two elements will further determine the level, content and tone of the speech (Mitchell, 1962). In addition, the purpose of the speech must first be established. According to Rus (2014) a speech can be either persuasive, proposing, ratifying, arguing or establishing credibility. Thus, it is depending on the speaker on what purpose is the speech aimed for. Lastly, Mitchell (1962) highlights that audience is an important element to any speech or presentation. He describes that if an expert failed to understand his or her audience, the purpose of the speech will be insignificant. Hence, a speaker must also understand his or her audience's background and deliver it at the right level.

According to Mitchell (1962) other than general speeches, paper or project presentation is also widely used in technical field. The presentation of a project or scholarly work is more structured and organized than other form of speech. It requires meticulous attention to facts and content and must be presented with accurate language and at suitable level.

b. Conference

In the field of industry, conference at section or division level is not an unfamiliar form of communication (Mitchell, 1962). It functions as a mean to spread information and to propose a technical solution to a problem. In achieving its purpose, Mitchell (1962) highlights important considerations to be developed among the members of a conference, which include:

a) think and work constructively
b) phrase your motion carefully
c) encourage your fellow members
d) support the right of the majority to decide and to carry out their decisions
e) offer leadership even though you hold no office
f) attend meetings regularly
g) accept and support decision of the majority

On the other hand, he also elaborated the relevant skills to be developed if an individual is in charge as a chair person, which concern on:

a) knowing the rules and presiding with ease and confidence
b) leading firmly
c) helping a member to state his or her motions clearly
d) keeping the meeting moving steadily ahead
e) avoiding ‘railroading’
f) creating a warm and friendly atmosphere to promote discussion
g) avoiding personalities in discussion

h) ensuring every member understand what he or she is voting on

i) taking all votes in a legally correct manner

(Mitchell, p.198-199, 1962).

Also, as a committee chairman, there are a number of considerations that need to be exposed, as outlined by Mitchell (p.199, 1962):

a) save everybody's time by bringing the tools for the committee's work

b) encourage but don't boss

c) be informal

d) divide the work

e) let members share in preparing the report

f) take a vote on each committee recommendation

g) share credit with your committee

In short, the proposed guidelines are context specified to technical field. These skills or recommendations are widely practiced in the technical field and thus, exposing these skills as part of oral technical communication skills are relevant to the TVET context.

c. visual aids in oral presentation

Mitchell (1962) believes that learning is constructed majorly by visual and comprehension. Therefore, visual aids are very important to develop an effective oral presentation. In fact, earlier, McMurrey (2002) has established that visual aids help to simplify information and attract audience to the intended presentation. Visual aids can take in many forms, such as pictures, diagrams, videos, audios, and other visuals. Thus, acquiring skills to produce visual aids are relevant to be a competent presenter.

Conclusively, the above discussion has provided the outlines of process and forms of oral technical communication. Generally, McMurrey (2002) has outlined the areas of planning in the oral technical communication. Mitchell's (1962) extended this discussion by describing forms of oral presentations that are relevant to the technical field. Hence, it is relevant to consider these proposed frameworks in developing the competencies of oral technical communication in TVET practice.

Technical communication curriculum in prominent TVET institutions.

This section maps the practice of technical communication in different TVET institutions across the world. The discussion also provides insights of the types, form and method of technical communication delivery practiced by the prominent institutions.

The Ulster Polytechnic. The importance of technical communication skills in engineering schools covers multiple disciplines of learning. Among the earliest introduction of technical communication skills in engineering schools was presented in Laverty's (1979) study. It is noted that in the 1976, the Ulster Polytechnic has identified the ineffectiveness of general "Communication Skills" course to enhance students' technical communication skills. The Course Committee of this institution has started to evaluate their current practice and propose an alternative to this problem. The course was revamped to address four key elements to effective integration of technical communication skills. Laverty (1979) mentioned that the new "Communication Skills" aims to develop:

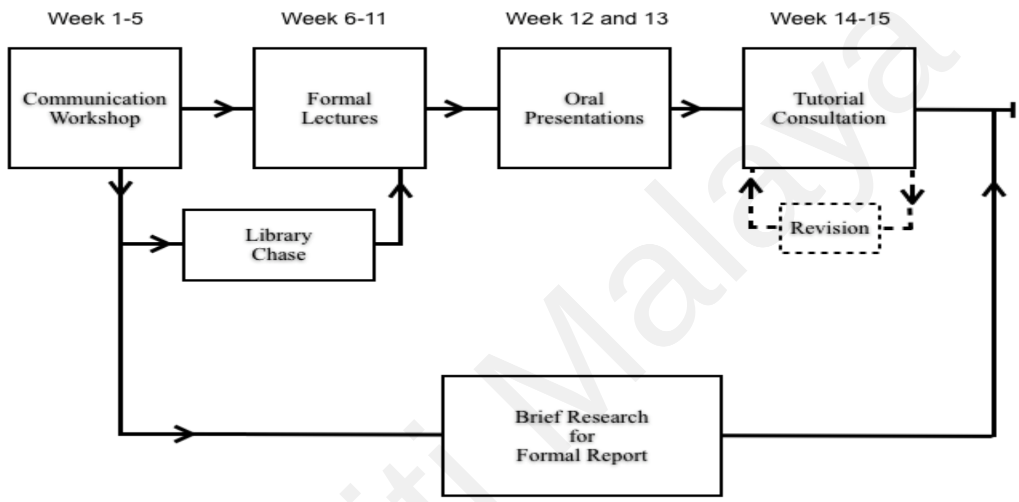
a) interpersonal relationships and working-in-team skills,

b) verbal communication skills in presenting ideas

c) writing skills in producing relevant technical reports, and

d) researching and gathering information skills in proposing a solution to rhetorical and real-life problems.

Within 16 weeks semester, the end result of this course was encouraging as Laverty (1979) mentioned, "…less than 5% of the participants failed to achieve a satisfactory pass level…" (p.134). The key success of this polytechnic might be the result of a structured design of the course.



Source: Laverty (p. 133, 1979)

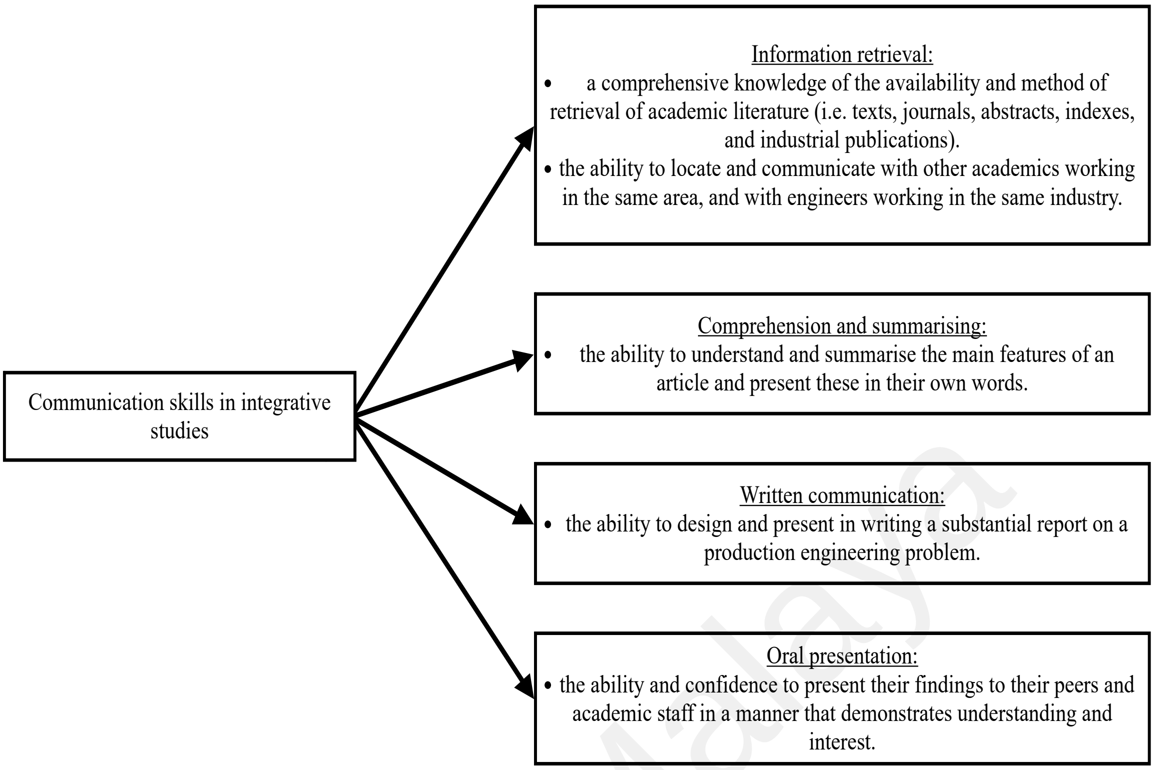
Figure 2.4 The Communication Skills course organization.

Figure 2.4 above represents the course organization of "Communication Skills" in this polytechnic. Within a limited timeframe, all four components were realized in four main phases of the course; communication workshops, formal lectures, oral presentations and tutorial consultation. In Week 1to 5, the students were introduced to group dynamic activities, which aims to develop interpersonal communication and working-in-team skills. However, the other elements were not treated in separation. "Library Chase" is a bridge between the communication workshops with the final product of the course- the research report. Laverty (1979) highlighted the importance of the "Library Chase" phase in equipping them researching and gathering relevant information skills. The information in turn, will be beneficial in formal lectures, oral presentations and in completing a research for formal report. By the end of Week 5, the students were asked to prepare a brief research report, which will be collected, by the end of the course.

In Week 6 to 11, the students were introduced to basic principles of an effective communication, identification of audience, library skills, and communication media. Also, a library-based research task was assigned to them during this phase. On the other hand, in Week 12 to 13, oral presentations of their research were conducted. Laverty (1979) noted that professional feedbacks were also given to help them to improve on their final project. The feedbacks were not only from the lecturers but also from their peers. Finally, in Week 14 to 16, the students were expected to consult academic staffs on their written research report and to be submitted in Week 16.

Conclusively, there are four major emphases in developing technical communication in this course; a) interpersonal relationships and communication skills, b) verbal presentation skills, c) written communication skills, and d) researching skills. These elements are deemed to be relevant to the working field and thus, were proven to be an effective alternative to the previous version of general communication course in Ulster Polytechnic.

The Leeds polytechnic. In Leeds Polytechnic, Nutman (1987) summarizes the phases of technical communication skills development in three phases; a) general studies, b) communication studies, and c) integrative studies. In the late 60s to mid-70s, the academicians in Leeds Polytechnic perceived the work-related skills as the development of general knowledge related engineering field only. Nutman (1987) explained that the content of the learning covers the political and economic structure of society, including various relevant aspects, such as art and literature, and courses were conducted by non-engineering academicians. Interestingly, the general acceptance of this course was in dispute. The engineering staffs felt that the course was not relevant and the students mostly viewed it as inappropriate for their future working field. Therefore, in mid 1970s to early 1980s, "Communication Studies" course was introduced. Nutman (1987) mentioned that the main objective of this course was to develop awareness of numerous aspects of communication. Theories of communication, and oral and written communicative activities were introduced in this course. Nevertheless, the students were not convinced with the importance of this course. In later stage, Nutman (1987) mentioned that a revamp was made to "Communication Studies" course. An "Integrative Studies" course was introduced and specifically highlighted the technical communication skills relevant to the engineering practice. He further explained that this course was designed based on the problem-solving model as proposed by Reitman (1964). This model focuses on evaluating the current situation (existing state), proposing an alternative (transformation), and establishing the desired outcomes in realizing the objectives (terminal state). Based on this model, Leeds Polytechnic has critically structured their visions- equipping students with relevant technical communication skills and introduced "Integrative Studies" to replace "Communication Studies" course.



Adapted from Nutman's (p.369, 1987).

Figure 2.5 The desired state in Integrative Studies course.

The above figure (Figure 2.5) represents the important of technical communication and its expected outcomes of the course. Basically, there four major skills being emphasize in this course; a) information retrieval, b) comprehension and summarizing, c) written communication, and d) oral presentation. The technical communication skills in this course are not only restricted to communicative activities in the working field but also has an influential effect on engineer's professional development. The skills under information retrieval are not restricted to writing report, project papers, letters and memorandums but also emphasizes on publication and contribution to the field. In the previous course, the "Communication Studies", the focus was more on theories and writing activities, especially in producing reports, letters and memorandum. Therefore, it is relevant to note that the revamp of this course has considered the importance of technical communication in advancing students' competencies at work.

In his study, Nutman (1987) reported that the current state of the students (based on the "Communication Studies" course performance) was discouraging. Nutman (1987) noted that their abilities in all four areas (as presented in Figure 3 above) were very poor. For instance, the students were found to be weak in information gathering. They struggled to retrieve and locate relevant information required for their tasks. The students were struggling to master summarizing skills (summarize the main features of an article) and to present their understanding to others. Also, their written skills were found to be poor, especially in writing a solid report, with accurate language and clear organization of ideas. In addition, they also faced difficulties in oral presentation tasks as some of them were uncertain the required information to be presented from their research project.

Alternatively, technical communication was introduced as early as to Year 1 engineering students, in "Experimental Engineering and Communications" subject, and "Integrative Studies 1" for Year 2 students, "Integrative Studies 2" for Year 3 students, and "Integrative Studies 3" for Year 4 students. Nutman (1987) noted that in Year 1 and 2, the focus was given in developing communication skills for competent engineering practice. The assignments require students to complete work diary, formal experiment report, literature search report, and oral presentation. The complexity of this course was increased in Year 3 and 4, as the major focus of this course was the application of technical communication in solving engineering problems. Students were expected to conduct case studies on the relevant issue to engineering. They were also encouraged to work in teams in order to expose them to various purpose of technical communication such as negotiating, presenting ideas, convincing audience and establish relationship with other members (Nutman, 1987). In short, the changes made in introducing technical communication have made these skills as part of competencies required for the field. This is in line with Wellington’s (1993) framework of work-school competencies, especially in preparing students with relevant working competencies required in their respective field.

The engineering schools in United States and Canada. In a large-scale study by Reaves (2004), she observed and analysed the practice of technical communication teaching and learning across 73 top-ranked engineering schools in United States and Canada. In her work, she argued that most of the instruction and training in engineering schools are not closely related to the working competencies. Based on the findings in her research, Reaves (2004) strongly affirmed that technical communication is an important course for Engineering schools in both countries. She also reviewed the result of the past studies (Benefield, Trentham, Khodadaki & Walker, 1997; Lang, Cruse, McVey & McMasters, 1999; Seat, Parsons & Poppen, 2001; Tryggvason, Thouless, Dutta, Ceccio & Tilbury, 2001) related to school-workplace competencies and noted that communication skills were ranked among the highly needed skills across industries, including engineering field. Therefore, she intended to explore the current practice of technical communication teaching in engineering schools across these two countries.

Based on the findings, Reaves (2004) noted that there were five methods to employ authentic integration of technical communication across the engineering courses. ‘Partnership’ is an effort made by various faculties in providing a relevant training for the students. 16 out of 73 engineering schools employed this method, where the course objectives, content and instruction were established between the partnering faculties (e.g. Engineering Faculty and Communication Faculty) in the respective universities. Since this method requires multiple parties, the process of establishing an agreement between partnering faculties must be completed in a greater detail in ensuring the aims of developing technical communication skills among engineering schools students are being realized respectively. Secondly, 'team teaching' was employed in a number of engineering schools in US and Canada. For instance, Northwestern, Georgia Technology, and the University of Calgary (in US) and University of Calgary (in Canada) have implemented this approach in their Engineering Faculty. A team from the Communication Faculty works together with engineering faculty in teaching the students. Each team of instructors will focus on their field of expertise and teach respective communication skills needed for the industry. The engineering faculty team will guide students to complete the report tasks and designing projects, while the communication faculty team will supervise on the language and skills development process in completing theses tasks.

On the other hand, a number of universities, such as the University of Michigan and Simon Fraser University, applied 'communication modules' in integrating technical communication in their respective faculty. The modules are presented and delivered in a separate and sometimes added on to engineering courses. Writing intensive courses, writing workshops and communication practices were among the instructional practices in these universities. Other than that, another form of authentic integration is "expert feedback". Reaves (20040 describes "expert feedback" as the process of evaluating students' projects by Engineering school, and English language instructors. For instance, the assistants from English department will first evaluate a completed report task before the students make amendments and send his or her final report to their instructors.

Lastly, the approach of "communication across the curriculum" tackles technical communication differently. Technical communication is embedded in all courses offered in engineering faculties. In Virginia's Technology's Materials Science and Engineering department, the students are required to complete different tasks, such as project reports, labouratory reports, technical memos, letters of application, poster presentations and other related tasks throughout seven engineering courses (Reaves, 2004). Other universities attempted this approach slightly different. For instance, in the University of California, Santa Barbara, engineering students are required to take three courses; Approaches to University Writing for Engineers, Academic writing for Engineers, and Writing and the Research Process for Engineers. Similarly, Reaves (2004) noted that this approach has been practiced in the University of Virginia. This university offered four courses, such as Language Communication and the Technological Society, Western Technology and Culture, the Engineer, Ethics and Society, and additional courses, which focus on extensive writing and oral communication.

Conclusively, authentic integration of technical communication in engineering schools across US and Canada has helped to consistently develop communication skills from the ground. Also, Reaves (2004) added that the aforementioned methods have a clearer focus and organized content in reiterating the importance of technical communication in the engineering schools. Of importance, these methods similarly emphasize on the development of work-related competencies as outlined by Wellington (1993) in previous section. Clearly, oral and written technical communication is the major focus in these engineering faculties. Again, this confirms the suggested skills outlined in Nutman's (1987) study, especially in developing students' ability to design and present reports in the area of learning.

The Helsinki University of Technology. The Language Centre at Helsinki University of Technology has proposed ‘Organisational Communication’ course in enhancing students’ communication skills in technical settings. In designing a relevant communication course for engineering students, Lappalainen (2010) has initially identified 15 prominent themes for this course. These themes are represented in the Figure 2.6 below:

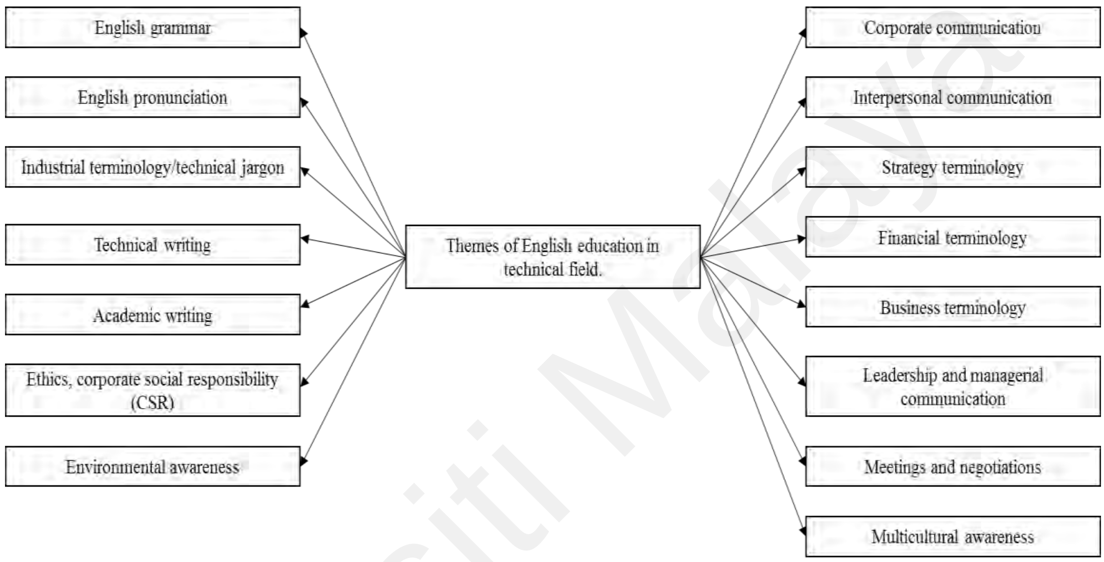


Figure 2.6: The themes of English education in technical field.

Based on a survey on 77 engineering students (from 1 to 5th year), they agreed that ‘meetings and negotiations’, ‘leadership and managerial communications’, ‘technical writing’, and ‘interpersonal communication’ are prominent elements to their industrial training experiences. Lappalainen (2010) has proposed ‘Organisational Communication’ course based on these key areas.

The underpinning philosophy of this course considers the integration of experiential problem-based method and encourages collabouration among students in teaching and learning activities. In reinforcing the development of communication skills, Lappalainen (2010) proposed learning tasks that necessitate intra and interpersonal communication activities, authentic communication practices in conveying, agreeing and arguing ideas, as well as introduction to content and context of technical field. The overall course outline is presented in Table 4 below.

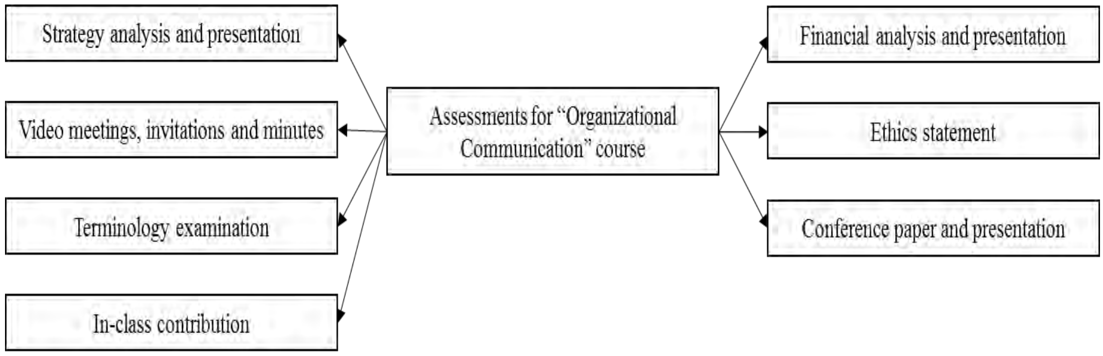
Table 2.2

The structure of 'Organizational Communication' course.

Lecture	Focus
1 and 2	Strategy: introduction to key business strategy and terminology, understanding current market position and future prospects, proposing future prospects of their own desired company.
3 and 4	Finance: introduction to key financial terms in engineering field, analysing the financial status and trends, presenting financial reporting.
5 and 6	Leadership: introduction to leader's competence requirements, introduction to managerial communications introduction to emotional intelligence in communication analysing leadership styles and communication patterns.
7 and 8	Corporate communication: introduction to corporate communication theories, introduction to crisis communication plans, discussing problems in their company communication.
9 and 10	Engineering identity, professional ethics and working morale: understanding engineering identity, professional ethics and working morale, analysing important elements to these areas, completing 'job interviews' task.
11	Terminology exam: testing students on jargons relevant to technical field, testing students on the gaps in a chief executive officer (CEO) review.
12	Conference: producing a conference paper on 'Communication and human interaction in engineering communities' for international audiences, presenting their findings in a gala-like setting.

Source: Lappalainen (p.398-399, 2010).

In evaluating students' performances, seven assignments were outlined in this course. These assignments majorly evaluate students' content knowledge and communication practices, and the assignments are as below:



Adapted from Lappalainen (p.399, 2010).

Figure 2.7 Assessments for "Organizational Communication" course.

The students were introduced to the lectures on the key areas (strategy, finance, leadership, corporate communication, and engineering identity, professional ethics and working morale) before the respective task was assigned to them.

Interestingly, Lappalainen (2010) has also provided an evaluation of this proposed course. The findings suggested that the course was generally beneficial for them. Teacher's competence was rated the highest among other areas. However, the students rated the course contents, and assignments as the lowest two areas of this course. Specifically, the students expressed that some of the contents of this course are not closely related to their field and the assignments were challenging and demanding. However, they still believed that the teaching and learning have provided them with ample 'language of industry'.

Reflecting the above course content to technical communication skills, there are a number of areas that overlaps with elements of technical communication. Majorly, in the proposed themes for this course, the areas such as 'technical writing', 'corporate communications', 'leadership and managerial communications', and 'meetings and negotiations' are rooted in technical communication skills. In the general framework of technical communication, the written and oral technical communication have been specifically associated to the important areas to be introduced for students in the technical field (McMurrey, 2002; Mitchell, 1962; Reaves, 2004; Rus, 2014). Clearly, technical writing activities such as conference paper writing, analysis of financial and strategy for their desired company, and introduction to technical jargons are closely related to written technical communication. Linking this to Mitchell's (1962) definition of written technical communication, these learning activities reflect writing practices that have "…a clinical objectivity and a completely predictable pattern" (p.6). As proposed by McMurrey (2002) these writing tasks can be considered as consultant technical writing, marketing literature, research report and technical journalism.

On the other hand, the oral presentations and in-class discussion of this course embody the oral technical communication skills. In achieving this, the students have been introduced to relevant lectures on the strategy, finance, leadership, corporate communication, and engineering identity, professional ethics and working morale before they were assigned to a number of oral tasks. This process reflects what Mitchell (1962) described as providing a strong foundation of knowledge for presenting and defending their professional opinions. The oral tasks also embody McMurrey's (2002) guidelines in developing oral technical communications, especially in providing vast opportunities for technical students to be actively involved in speech and conference presentations.

In addition, the overall design of this course is in agreement to Rus's (2014) notion of communication with specific purposes to a specific audience, and Laverty's (1979) and Nutman's (1987) key areas of technical communication skills. For instance, Laverty (1979) and Nutman (1987) emphasized on the process of developing interpersonal skills, verbal communication in group communication, writing skills on technical documents, and researching and literature skills, in developing technical communication skills. Conclusively, the implementation of ‘Organisational Communication’ course in the Helsinki University of Technology appears to be coherent to the process of developing technical communication skills. Both forms of technical communication skills (written and oral) were introduced and practiced in the engineering course in equipping students with ‘language of industry’. In fact, Lappalainen (2010) has reported the students’ views on this course and generally they viewed this course as practically relevant for their future work.

The comparison of technical communication courses across TVET institutions. In the previous section (Technical communication curriculum in TVET institutions), it has been presented how technical communication was being implemented and practiced across four different prominent TVET institutions. Based on the discussion from previous section, there are two important comparisons that can be derived from the practice of technical communication curriculum across these institutions.

Firstly, it is very important to compare the content of learning for technical communication courses in different TVET institutions. Figure 2.8 below represents the similarities of the content of learning in the selected TVET institutions. In Ulster Polytechnic, the content of learning focuses on developing interpersonal and working-in-team skills, verbal and presentation skills, technical writing, and research skills (or known as library skills). These contents of learning are almost similar across all institutions. However, in Leeds Polytechnic, three prominent skills (information retrieval/researching skills, technical writing skills and oral presentation skills) were being majorly emphasized. Nevertheless, Nutman (1987) did not deny its importance to technical field. Interpersonal skills or working-in-group skills was embedded into three other prominent skills. For instance, in the completion of the tasks, the students were required to work in teams to produce a technical report and present them in groups.

On the other hand, the Engineering schools in the US and Canada introduced graphical communication skills as one of the important components to technical communication course. However, this does not mean the focus is different to Ulster Polytechnic and Helsinki University of Technology. According to Mitchell (1962), graphical communication is considered as part of both oral and written technical communication. In fact, McMurrey (2002) has highlighted the importance of visual aids and other forms of technological tools to enhance oral and written technical communication.

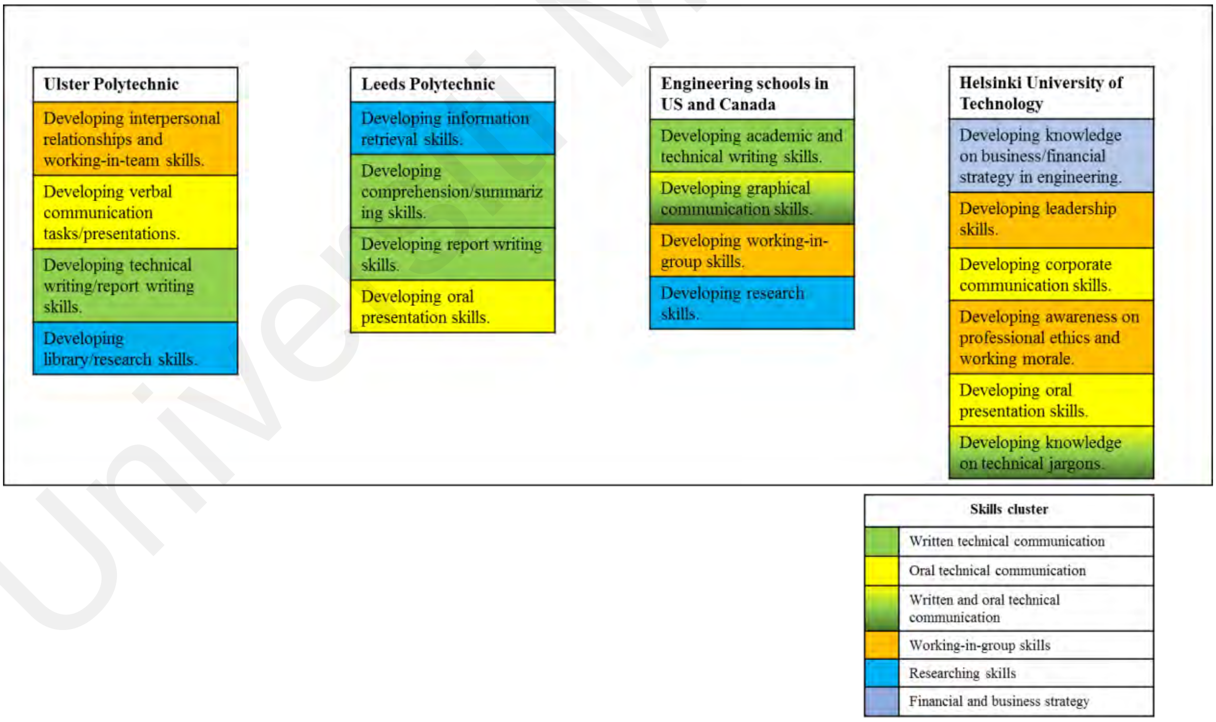


Figure 2.8 The content of learning of technical communication courses across TVET institutions.

Very interestingly, the Helsinki University of Technology has proposed additional focus of learning to technical communication course. According to Lappalainen (2010), the introduction to ‘Financial and Business Strategy’ was beneficial as a knowledge foundation for engineering students. During this course, the students were introduced to technical, business and financial jargons, the current market settings and financial strategy plans for engineering. Husain, Mustapha, Malik, and Mokhtar (2014) supported that the introduction to business and financial strategy is very beneficial to develop students’ entrepreneurship skills, which is an important component to employability skills in 21st century. However, the integration of ‘Financial and Business Strategy’ focuses more on entrepreneurship skills compared to technical communication skills. As outlined by Mitchell (1962), the technical communication theory concerns on the content, conventions and forms of communication in the technical field. Also, this theory considers the audience level, arrangements of content, and scientific value and techniques, which will help a worker to communicate effectively at work. Therefore, it is relevant to state the integration of ‘Financial and Business Strategy’ is an additional knowledge-based foundation for the entrepreneurship, rather than technical communication skills.

Secondly, across all four TVET institutions, it is apparent that there are nine methods of delivery in introducing technical communication. Based on Table 2.3 below, formal lectures and collaborative learning activities were used across all four institutions. This method of delivery is sued to introduce students to the theoretical foundation and principles of technical communication. For instance, in Ulster Polytechnic, Laverty (1979) described that the purpose of formal lectures (Week 6 to 11) was to introduce the components of an effective communication at work, skills of understanding the audience, and library skills, which are very helpful not only to complete the course but also for their future working field.

Table 2.3

The delivery methods of technical communication courses across TVET institutions

	Ulster Polytechnic	Leeds Polytechnic	Engineering schools in US and Canada	Helsinki University of Technology
Formal lectures	/	/	/	/
Tutorial	/		/	/
Collaborative learning activities	/	/	/	/
Field training		/	/	
Team teaching			/	
Communication modules			/	
Expert feedback	/		/	/
Partnership	/		/	
Communication across curriculum		/	/	

Other than that, tutorial and expert feedback were used in all institutions except Leeds Polytechnic. According to Lappalainen (2010), Laverty (1979) and Reave (2004), tutorial is very important for students for project or report completion. Through this delivery method, the students were given ample opportunities to work in groups and consult their instructors in completing the in-class tasks and their assignments. Also, other skills such as researching, interpersonal, and the foundation knowledge on how to produce quality technical documents and presentations were being introduced and develop through this delivery method.

Besides, team teaching and communication modules were only applied in the Engineering schools in the US and Canada. According to Reaves (2004), communication modules were used as supplementary to major Engineering courses.

For instance, in the University of Michigan and Simon Fraser University, communication modules used this method of delivery in introducing students to technical writing and communication to Engineering students. Very differently, team teaching requires a team from Communication Faculty to work together with Engineering Faculty to develop technical writing and oral presentations that use real working examples and problems.

In short, the content of learning and delivery methods for technical communication vary across TVET institutions. However, there are a number of similarities found in the teaching and learning of this course. Based on the above discussion, it is found that developing technical writing, oral communication, interpersonal or working-in-team skills, and researching skills are very prominent to technical communication. On the other hand, in delivery its content of learning, all institutions applied formal lectures to introduce the principles of an effective communication at work (both written and oral) and collabourative learning activities to encourage interpersonal and researching skills. Therefore, in the process of developing an industry-based technical communication skill, the above findings should be considered in designing a sound pedagogical model for Malaysian Vocational Colleges.

Theoretical Framework

General communication process. Dean and Bryson (1961) defines communication as a process of conveying and receiving thoughts and feelings to others. This process involves two main components which are communicators and message. Littlejohn and Foss (2005) represent communication process as in Figure 2.9 below.

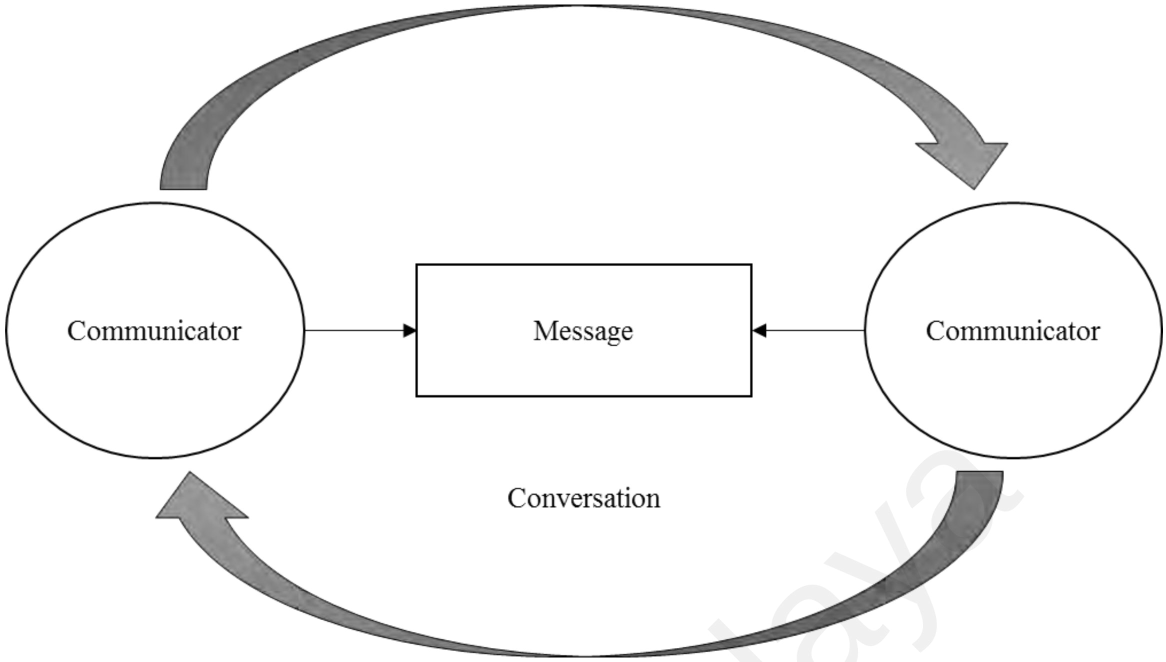
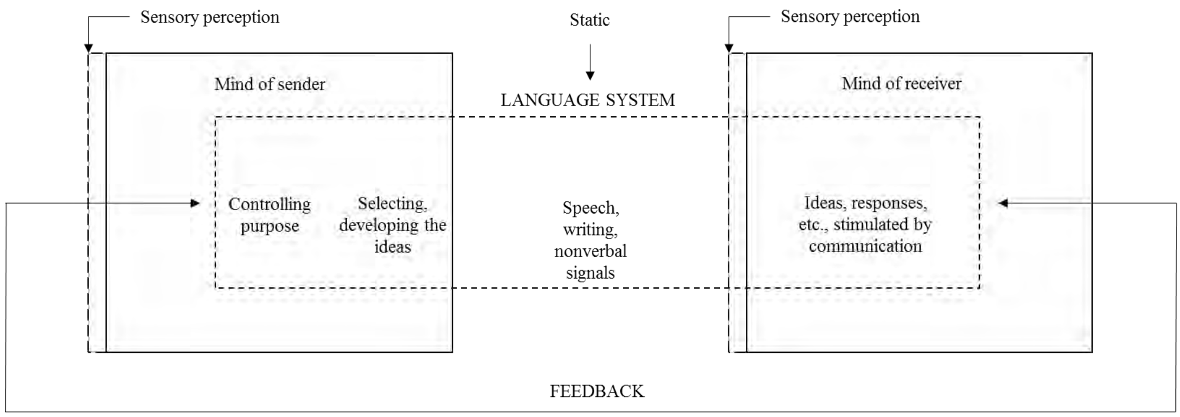


Figure 2.9 The general communication process.

Based on this figure (Figure 2.9), a conversation is achieved when both communicators convey and receive messages from one another. In a beginning process, a communicator will start to initiate conversation by conveying a message. The other communicator will first act as a listener. As it progresses, both communicators will start exchanging and receiving messages. To further understand this process, it is relevant to refer to Dean and Bryson's (1961) communication process model as it represents a detailed description of this process.



Source: Dean and Bryson (p.6, 1961)

Figure 2.10 The communication process model.

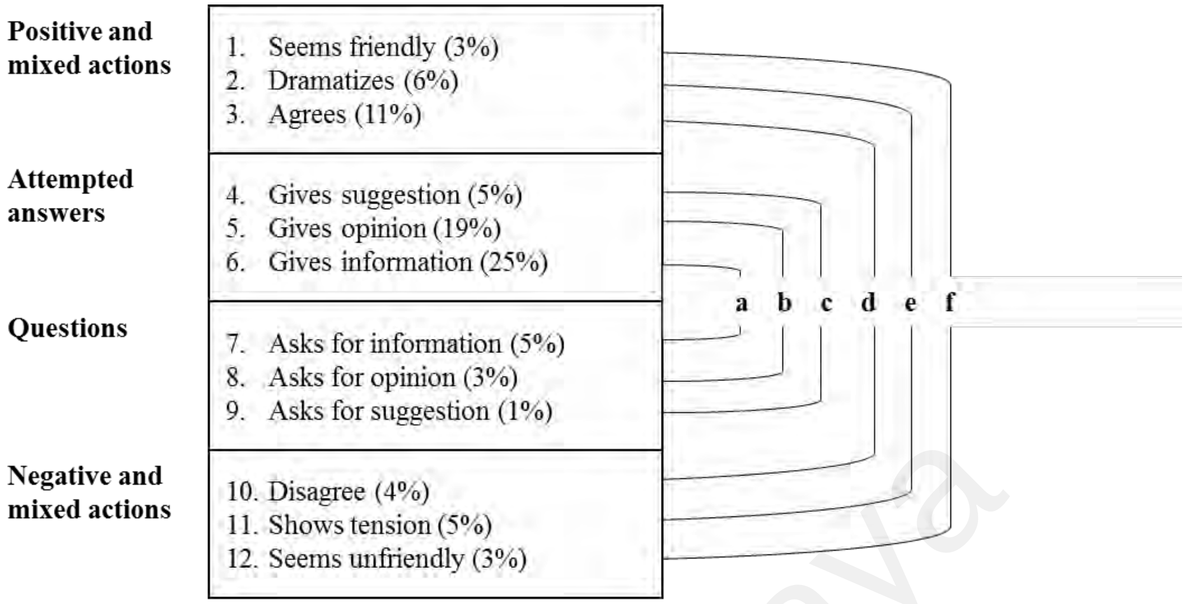
Dean and Bryson (1961) have a proposed a more comprehensive and detailed process of communication as they believed that communication is a complex process. In their model, they have tried to illustrate all possible elements and phases in communication. Based on the Figure 2.10 above, both sender and receiver play an important to communication process. Both roles are interchangeable during this process. In this model, the “sensory perception” refers to general knowledge based on observations or messages from others. On the other hand, the “language system” refers to process of how to represent the thinking and knowledge with language. According to Dean and Bryson (1961), this starts with “controlling purpose” which refers to establishing the purpose of communication. As a sender of a message, the person needs to establish his or her intention of the communication. Next, this intention will be transformed into ideas in the “selecting, developing the ideas”. This process requires a person to process their knowledge or experiences of a particular topic in a comprehensive form of language, and to be presented in language forms. In the next stage, the “speech, writing, nonverbal signals”, the speaker will choose the forms of communication in presenting his or her idea. When the information has been presented to the receiver, the receiver will decode the message and internalize the information.

If the receiver intends to reply or respond to the information, he or she will repeat the same process. This process is termed as “feedback” (Dean & Bryson, 1961). In this model, Dean and Bryson (1961) also acknowledged the existence of interference in communication and they termed this as “static”. This interference might be caused by the internal factors, such as nervousness and poor communication habits, or external factors, such as noise and interruption from the surrounding. In short, this model provides a more detailed description of communication process. It is apparent that there are four important skills (establishing purpose, selecting and developing ideas, selecting forms of communication, and decoding the message) that are categorized under the “language system”. In the “speech, writing, nonverbal signals”, the language proficiency plays an important role to an effective communication. According to Dean and Bryson (1961), an adequate command of language is pivotal to this process. They further mentioned that “language system” concerns on the development of both transmission and reception skills. The transmission skills refer to speaking and writing, and reception skills refer to reading and listening. In communication, Dean and Bryson (1961) highlighted the importance of acquiring the language proficiency and understanding the nature of communication through all skills. For instance, in transmission skills, Dean and Bryson (1961) noted that the communicators should be able to set purpose of communication and acknowledge the needs of the audience. This is also applicable to communication through written forms, where the ability to clearly articulate the message is important to an effective communication.

Based on this discussion, it is relevant to state that technical communication falls under the general communication theory. Generally, technical communication concerns on the roles of speakers, purposes and the content of communication (Lappalainen, 2010; Mitchell, 1962; McMurrey, 2002; Rus, 2014). In fact, a recent study by Rus (2014) has explored the concept of technical communication in comparison to other communication models. She asserted that due to similar process in communicating message as presented in the above figures (Figure 10 and 11), technical communication is seen as "…part of the general communication scheme, sharing its most prominent features..." (p.655). However, the similarities between technical communication and general communication shame should be treated with cautious. Based on her argument, technical communication is bound to communicating process in technical field, or as she termed as "strategic communication", where the content and context of the intended message, purpose of communication, and the understanding of audience's background and how to establish a positive relationship with them are the main characteristics of technical communication. In the next section (Technical communication theory), these characteristics are further discussed based on Rus's (2014) and other relevant frameworks of technical communication.

On the other hand, Littlejohn and Foss (2005) mentioned that the communication settings will further define the communication process. In their work, they categorized communication settings into three, which are group, organization, media, and culture and society. However, for the context of general communication in technical working field, only two communication settings will be discussed. In previous section (Chapter 1), it has been established that interpersonal and working-in-team communication skills are among the prominent skills highlighted in technical communication skills. Based on Littlejohn and Foss's (2005) categorization of communication settings, it is found that group and organization communication are closely related to technical communication. Both communication settings concern on interpersonal communication that happens in a small group or organization. In technical communication, the main purpose of communication is to enable workers to communicate effectively either in written, oral or visual form to achieve expected goals of work. A number of studies have highlighted the importance of technical communication to working field as it majorly focuses on the development of the professional characteristics, and the ability to present the content and context of communication in achieving professional goals of work (Brinkman & van der Geest, 2003; Cook, 2002; Lappalainen, 2010; Rus, 2014). Therefore, it is relevant to state that technical communication reflects the general communication theory, especially the group and organization communication theory.

Group communication. In group communication, Littlejohn and Foss (2005) referred to Interaction Process Analysis theory of communication, as proposed by Bales (1950). Interestingly, Bales's (1950) model proposed the types of messages used in group communication settings, which are categorized into four main categories: a) positive and mixed actions, b) attempted answers, c) questions, and d) negative and mixed actions (refer Figure 2.11 below).



a = Problems of communication
b = Problems of evaluation
c = Problems of control
d = Problems of decision
e = Problems of tension reduction
f = Problems of reintegration

Source: Bale's (1950, as cited in Littlejohn & Foss, p.217, 2005)

Figure 2.11 Bales's (1950) Interaction Process Analysis theory.

According to Bales (1950), in the "Positive and mixed actions" category, the communication messages are used to show friendliness, dramatize and agree on the point given by the other party. Typically, these messages are used to establish a positive relationship in a communication setting. On a direct opposite, the "Negative and mixed actions" messages are used to show disagreement or disapproval to the message received or topic and content of conversation. In the above figure, if both parties did not have a mutual agreement, the situation is called as the "problem of decision". In addition, if both parties displayed their disapproval to one another by their expressions (verbal and nonverbal), the situation is called as the "problems of tension reduction", and if both parties showed different level of friendliness in communication, it is called as the "problem of reintegration".

On the other hand, Bales (1950) paired both "Attempted answers" and "Questions" together. This is because, in a group communication setting, there will be suggestions, questions and information shared from one party to another. In the above figure, it is clear how Bales (1950) linked asking (for information, opinion and suggestion) with giving responses to it. Littlejohn and Foss (2005) further described that if both parties did not adequately share either information, opinion or suggestion, communication problems will arise and thus, affecting an effective communication.

Organization communication. The organization communication is very fundamental to workplace competency. An effective organization communication will help individuals to be competent in completing working tasks and to be an active contributor to the organization. Pearson, Nelson, Titsworth and Harter (2006) defined organization communication as the process of maintaining structure and order by interacting with each other and to achieve similar (organizational) goals. One of the prominent theory to describe organization communication is Jablin's Organizational Assimilation (1987) theory. According to Dainton and Zelly (2011), this theory describes how an individual learn and adapt the culture of an organization through interacting with other individuals in a working setting. Figure 2.12 below illustrates the assimilation process as proposed by Jablin (1987).

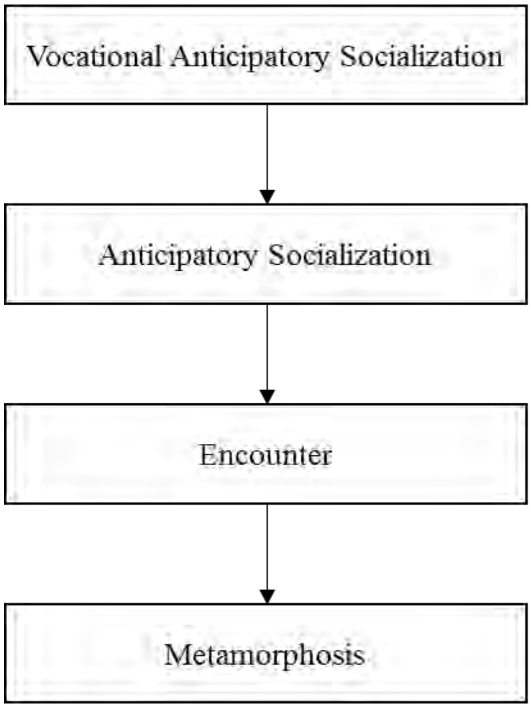


Figure 2.12 The Organizational Assimilation theory.

In the first phase, the "Vocational Anticipatory Socialization", Dainton and Zelly (2011) refers this phase as a process of understanding established expectations and beliefs in a specific working setting before entering the field. Typically, the initial expectations will be influenced by media, other people's experiences and personal observations. Then, in the second phase, the "Anticipatory Socializations", an individual will start to learn about the organization in a greater detail. Jablin (1987) mentioned that this process requires an individual to interact with the members of the organization, in order to understand their first-hand experiences of working in a particular organization, before joining. Then, when an individual decided to enter or join a company, he or she will start to learn the 'real' experiences and encounters at work. According to Dainton and Zelly (2011), the communication process at this stage is very vital in order to help an individual to understand the norms and established rules of a company. At this stage, communication is vital. A newcomer is expected to learn and adapt quickly to the organization culture of work. Similar to other researchers' opinion (Dahm, Yates, Ogden, Rooney & Sheldon, 2015; Nagendra et al., 2013; Wellington, 1993), the "Encounter" phase requires an effective communication in order to help a newcomer to be able to be part of an organization and contribute to its productivity. Lastly, the "Metamorphosis" phase is described as transitioning process from being outsider to insider (Jablin, 1987). Dainton and Zelly (2011) added that at this phase, an individual will start to internalize the norms and established rules and act accordingly. When an individual has reached this phase, he or she is expected to work and achieve the organizational goals. Pearson et al. (2006) added that the process of socialization in the workplace is a continuous process. Learning the norms is just the beginning of an organizational communication. Other communicative experiences such as in completing tasks, team discussions and resolving issues at work will further help an individual to develop an in-depth understanding of his or her roles and organizational expectations.

Technical communication theory. In an earlier work by Mitchell (1962), he has deliberately discussed the nature of technical communication. He firmly believes that technical communication is underpinning communication strategy across "…all fields of science and engineering, and to an industrial society." (p.1). His statement is relevant as technical communication plays an influential role in almost all stages of formalized scientific method; defining the problem, searching relevant literature to the area of problem, conducting some independent works on the problem, reporting on the findings of the independent work. Therefore, Mitchell (1962) further explains that the structure of technical communication consists of eight important elements, as presented in Figure 2.13 below.

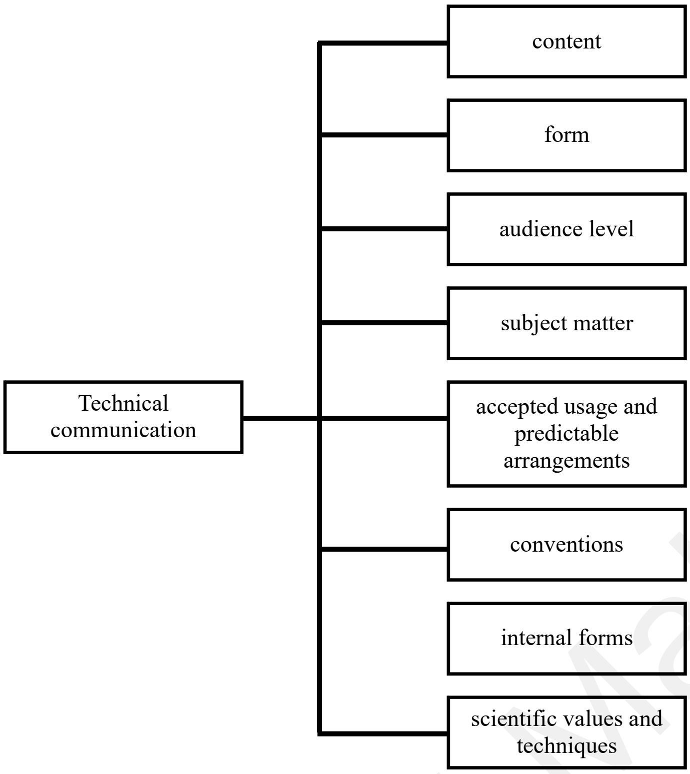


Figure 2.13 The elements of technical communication as presented by Mitchell (1962).

Mitchell (1962) described the content and form of technical communication is bound to technical and scientific context. According to him, the information theory suggested that information is more appealing and comprehensible if it is presented in a familiar form. For the case of technical field, this belief has been held and as the result, they are specific forms, especially on "…the amount and type of details it contains." (p.2) in presenting technical documents in this field.

In addition, technical communication closely considers the audience. Mitchell (1962) described that technical writers or communicators cautiously consider their audience and pitch the information accurately using variety of forms of documents and methods of delivery. For instance, in providing information on how to operate an object, the description should be presented accordingly (avoiding complicated technical jargons) and supported with visual aids if necessary.

According to Mitchell (1962), 'subject matter' affects the forms of technical communication. Mitchell (1962) noted that different forms of texts have different function or subject matter. For instance, description of hardware provides information concerning the physical quality and function of a hardware. Very differently, the text in instructions or directions manual is presented in comprehensive manner to guide users on how to operate hardware.

Furthermore, Mitchell (1962) stated that the forms of technical communication are presented in accepted and predictable arrangements and are affected by conventions. In technical field, communication is a mean to deliver information to users and among practitioners. An effective technical communication, especially in written documents must convey the information in familiarized or conventional form. For instance, in research report writing, the tone of voice must be 'emotionless' and only presents factual information (McMurrey, 2002). Also, the form of documents to be delivered between companies must be in a formalized form, such as in memorandum, but are different if they presented to the general public, such as technical article or news release.

In addition, Mitchell (1962) described that the purpose of a communication helps to determine its internal form. In technical field, the purpose of communication is not only restricted to deliver information for users but also aims to persuade, propose new ideas, build credibility, reinforce ideas, arguing, and ask for changes (Rus, 2014). Therefore, the process of presenting the information is depending on its specific purpose. For instance, in a proposal report, the internal form, such as the tone of voice and presentation of ideas must be presented in a convincing manner. An argument must be supported by facts and is presented with an in-depth analysis of findings.

Lastly, Mitchell (1962) stated that technical communication employs scientific value and techniques "...of the scientist rather than those the humanist." (p.3). He firmly stated that the forms of technical communication must follow fixed formulas and patterns. For instance, in producing a formal technical report, major sections must be presented accordingly. The data must be presented in a prescribed layout or formula and the discussion must be in logical coherence.

In short, the above discussion has provided an overview of what and how technical communication looks like. Clearly, technical communication is bound to the content, context and its conventions. Each of these elements helps to define technical communication and provide a clearer view of areas of skills to be developed in introducing technical communication.

Rus (2014) argued that the general communication scheme is inadequate to represent communication process in the technical field. This is because, technical communication is a strategic communication that emphasises on the importance of communication and technology in the work field. Hence, Rus (2014) has proposed four important elements in representing technical communication; audience, relationship, purpose and context (as presented in Table 2.4 below). The audience and relationship with the speaker are influential to technical communication. It determines the "...discursive features and the register marks of the communication" (Rus, p.656, 2014). Very differently, technical communication does not only seek to convey message. The purposes of technical communication include the conversation to offer new insights, provide arguments and open up opportunities for advancement of ideas. Also, the technical communication takes place in different forms- either between individual or larger groups. Similarly, these four elements reflect Wellington's (1993) general concept of communication in workplace, where interpersonal skills (which includes communication with team, customer and people from different background) and basic technical writing skills are viewed as important elements to employability. Undeniably, technical communication has a specific focus and audience. Therefore, technical communication is a set of skills that should be introduced and developed among TVET students in order to prepare them for the working world.

Table 2.4

Elements of technical communication skills as proposed by Rus (2014).

Audience: The targeted audience will influence the choice of discursive features and of the register marks.
Relationship: The relationship between a sender and audience will influence the discourse used in communicating.
Purpose: a) persuasion - to convince the rightfulness of an idea. b) instruction - to enrich audience's knowledge. c) entertainment - to create a relaxation conversation, amusement and leisure. d) open new possibilities of belief and value. e) propose change in ideas and action. f) build credibility for future persuasion. g) establish credibility for current situation. h) create doubts about opposing ideas or actions. i) refute opposing ideas. j) create new audience k) build community with audience. l) ratify or reinforce community values or ideas. m) ask for small changes in belief or action. n) ask for moderate changes in belief or action. Context: a) interpersonal context b) small group c) organizational d) public address e) mass communication

Source: Rus (p.656-657, 2014).

In another literature, Brinkman and van der Geest (2003) have provided a specific framework of technical communication skills that should be introduced and developed in TVET curriculum. What has been presented by Rus (2014) was a general description of technical communication and its key characteristics in describing what is meant by ‘specified’ communication. However, Rus (2014) only states the context of technical communication without characterizing the relavnt skills to be acquired in these different communication settings. In Table 2.5 below, Brinkman and van der Geest (2003) have presented four layers of technical communication skills that are applicable across different communication contexts. In Layer 1 (the text craftsmanship), the focus is on developing a foundation for written and oral technical communication. Knowledge on information retrieving, types of technical documents, and language used are viewed as pivotal skills to develop a competent technical communicator. In the second layer (the genre competence), Brinkman and van der Geest (2003) highlighted the importance of introducing technical students to forms, elements and conventions of technical communication in oral, visual and written forms. Generally, technical communication can be represented in these three forms and they share almost identical elements and foundation skills. In the framework below, Brinkman and van der Geest (2003) specifically linked these forms of technical communication to specific tasks and document used in the technical field. This is in line with McMurrey’s (2002) work (deliberately discussed in the next section), as both authors agreed on the importance of developing knowledge and skills in producing different types of written texts, visual aids, and oral presentations in technical field.

In Layer 3 (strategic thinking), Brinkman and van der Geest (2003) has introduced a technical communication strategy, which covers the ability to analyze communicative situation, pitch the information accordingly, deliver the information to suit its established purpose, and demonstrate awareness of the ethical aspects of communication. Finally, in Layer 4 (feedback competence), the central focus is to develop the process of formulating relevant feedbacks in communication. It is known that communication involves multiple parties, and thus knowing how to provide appropriate feedbacks is very prominent to establish an effective communication in technical field. Also, Brinkman and van der Geest (2003) expanded the dimension of feedback competence, by specifically focusing on developing the ability to reflect and respond to different communicative settings and across the skills in the aforementioned layers.

Table 2.5

Skills in technical communication as presented in Brinkman and van der Geest's (2003) study.

<u>Layer 1: Text craftsmanship</u>

a. produce text with a clear organization and uses organizational cues to support the reader/listener navigating through the text (e.g. preview, forward and backward referencing, enumeration, and structure-signaling sentences or phrases).
b. build a logical argument and signals the argumentative structure to reader/listener with verbal means.
c. understand the function of titles and headings, introductions and conclusions, and demonstrate their understanding (how and when to use them).
d. know the various types of summaries and demonstrate heir understanding (how and when to use them).
e. recognize various style registers and can write or speak in various styles that are appropriate for scientific and public discourse on engineering issues.

f. recognize style variations (e.g. level of difficulty and exactness, density of information, distance between author and reader, and liveliness) and apply them in their own texts.

g. understand basic principles of layout and typography and use them to support readers of the text.

h. produce standard procedures standard language, both when writing and speaking.

Layer 2: Genre competence

a. know the conventional organization of the texts and genres that are most common in their discipline and the rationale behind it.

b. know the verbal and graphical conventions for the elements of technical reports (e.g. cover, title page, foreword, abstract, summary, table of contents, lists, conclusions, recommendation, notes, bibliography, appendix, index) and apply them in their own reports, or can explain why non-compliance is appropriate for the rhetorical situation at hand.

c. know the conventions for technical presentations and meetings, and apply them. If not applied, they can explain why non-compliance is appropriate for the rhetorical situation at hand.

d. understand the function and use of sketches, drawings, figures, graphs, diagrams, tables and captions, and demonstrate mastery of conventions of these elements, both in oral and written presentations.

e. demonstrate good use of sources to build up a scientific argument, and signals the use and evaluation of sources to the readers/listeners.

f. refer to sources in line with the style requirements of a particular publication, and can create quotations, title descriptions and lists of references that meet the prevalent style guides in their discipline.

Layer 3: Strategic thinking

a. analyze communicative situations in terms of organizational and communication goals, primary and secondary audiences and their interests and needs, and requirements and conditions for producing the communication.
b. demonstrate that they can analyze the trade-off between (organizational) self-representation, the implied and actual reader/listener, the information to be conveyed, and the goals to be achieved.
c. demonstrate an understanding of the interaction between different communicative goals (e.g. information transfer, persuasion, instruction and emotional appeal) within the context of a particular text.
d. support claims and points of view with arguments that are both logical and convincing for the audience, and demonstrate the use of verbal and visual means to present argumentation convincingly, and can judge the validity and persuasiveness of arguments of others.
e. demonstrate awareness of the ethical aspects of public and scientific communication on engineering issues.

Layer 4: Feedback competence

a. give feedback on all levels of communicative competence: strategic, genres and text.
b. give feedback that points out the problem, diagnose the cause and suggest remedies.

c. formulate feedback in a positive way, focusing on the position and perspective of the writer, taking the rhetorical situation of writer and reviewer into account.

Source: Brinkman and van der Geest (p.69-72, 2003).

In a different study, Lappalainen (2010) has evaluated important themes of English education in relation to technical field. The themes are illustrated in Figure 2.14 below:

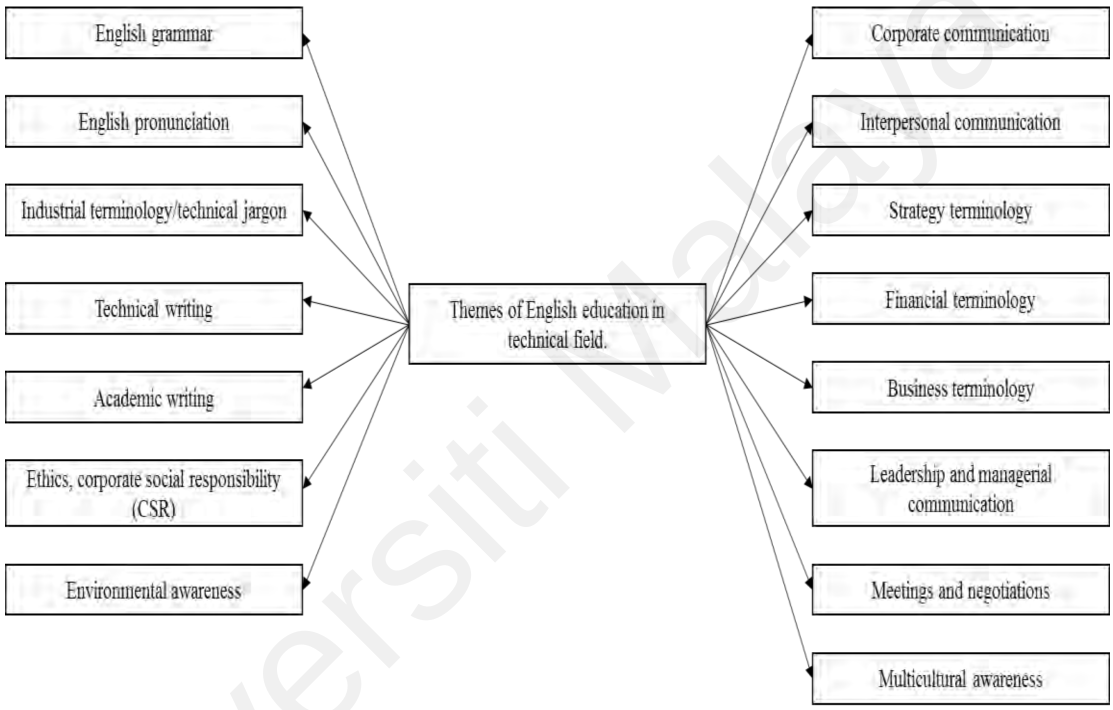
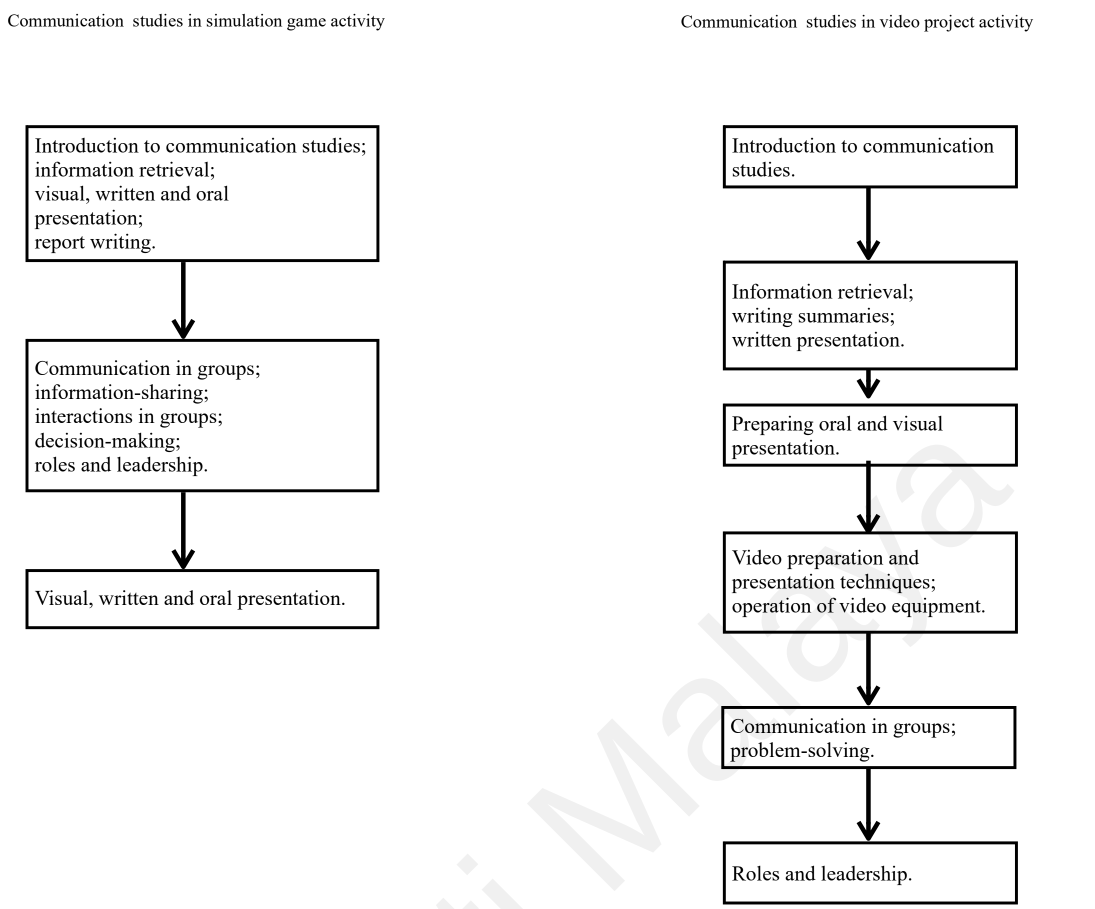


Figure 2.14 Themes of English education in technical communication.

However, based on the empirical survey on engineering students in Helsinki University of Technology, it is found that 'meetings and negotiations', 'leadership and managerial communications', 'technical writing', and 'interpersonal communication' are viewed as prominent skills to the engineering field. Therefore, Lappalainen (2010) has proposed 'Organisational Communication' course based on these key areas.

Very interestingly, Lappalainen (2010) tried to link the content of English language learning course to the needs of the engineering field. However, the students did not place language elements as the top priority in the communication skills for the engineers. However, these skills are still embedded in the course. Generally, the underpinning philosophy of 'Organisational communication' course as proposed by Lappalainen (2010) is rooted in collaborative and experiential learning, and close reference to industry knowledge, competency and jargons used in the real context of technical field. Also, the communication practices are widely provided in this course, as Lappalainen (2010) believes that interpersonal and group communication, corporate communication and multicultural awareness are the prominent features that describe communication in technical field. Again, these elements are coherent with the focus and elements of technical communication skills.



Adapted from Marshall's (1982) work.

Figure 2.15 The content of communication studies in Marshall's (1982) study.

On the other hand, Marshall (1982) has also attempted to propose an interactive learning experience for 'Communication studies' course by integrating simulation game and video project activity. He strongly believes that establishing a discrete syllabus for technical communication is pivotal in equipping engineering students with a strong visual, oral and written technical communication skills. However, the major problem hindering its effectiveness is found to be in the tone of teaching and learning of this course. Marshall (1982) appointed that students' interests on 'Communication studies' was very poor as it typically presents theories or principles of technical communication. His study has added flesh to the technical communication literature, as the proposed teaching and learning framework successfully integrated interactive and hands-on activities in learning process. Basically, as presented in the Figure 2.15 above, both activities similarly follow three major phases of developing technical communication skills. In both learning settings, it is found that familiarization to information gathering and presentation skills are presented in the early stage of learning. The importance of information retrieval skills has been similarly addressed in the literature (Brinkman & van der Geest, 2003; Laverty, 1979; McMurrey, 2002; Nutman, 1987). These authors agreed that communication in technical field requires a strong foundation of technical knowledge and understanding. The knowledge will later be translated into ideas and can be presented in written, visual or oral form.

In the next stage, the 'group activities' are aimed to encourage interpersonal and group communication skills. In the earlier part of the discussion, Rus (2014) and Brinkman and van der Geest (2003) have presented the context of technical communication, which covers both intrapersonal, interpersonal and group communication skills. In fact, in Lappalainen's (2010) study, these skills were listed as important elements of technical communication and were found to be beneficial to be inculcated in technical communication course.

On the other hand, in the final phase, students are expected to apply these skills by completing the simulation game and video project. This phase reflects the integration of all four layers of technical communication skills (as proposed by Brinkman & van der Geest, 2003) in different contexts of communication (Rus, 2014). Interestingly, the results of this study were encouraging, as Marshall (1982) noted that these activities were able to motivate and encourage students to apply technical communication skills in an authentic learning experiences, which in turn helped to prepare them for their future work.

Cook (2002) has argued that the available frameworks for technical communication are inadequate in representing relevant literacies and competencies needed for the twenty-first century workplace. In resolving this issue, she has proposed six key literacies for technical communication, as below (Table 2.6):

Table 2.6

The six key literacies to technical communication.

Basic Literacy

a. Gathering information more efficiently
b. Making appropriate reader-based decisions about data presentation, document form, and document construction
c. Engaging readers through effective and appropriate reader-based writing techniques
d. Responding to and within complex writing situations
e. Making informed decisions about usage, grammar, mechanics, styles, and graphic representations

Rhetorical Literacy

a. Understanding the audience's role in shaping effective discourse
b. Analytical skills for identifying and responding to the audience in terms of the communication's purpose and the writing situation
c. Knowledge of and abilities to choose and apply invention strategies, depending upon specific audience, purpose, and writing situation
d. Awareness of one's own ideological stance as well as the given audience's stance(s)

Social Literacy

a. Working effectively with others in a variety of capacities
b. Identify and work within organizational settings and sometimes work to reform these settings
c. Handle conflict within groups positively and constructively
d. Recognize discourse communities' social conventions and expectations for document design and graphical display of information

Technological Literacy

a. Working knowledge of technologies that helps professional communicators to produce communications, documents or products
b. Awareness of how these technologies promote social-interactions and collaboration
c. Ability to research how users work with technologies
d. Ability to critique this research and act upon it to make decision and produce documents designed with and for users

Ethical Literacy

a. Identify and explain ethical choices in projects
b. Analysis of ethical cases during classroom discussions

Critical Literacy

a. Ability to recognize and consider ideological stance and power structure and the willingness to take action to assist those in need
b. Contextualize their writing, the situation and the concerns of relevant parties

Source: Cook (p.8-17, 2002).

The first layer, basic literacy, refers to how reading and writing skills are embedded in technical communication in enhancing students' abilities to communicate effectively (Cook, 2002). In achieving this, information retrieval skills, language competency, and ability to produce a research-based writing must first be developed. This cluster of skills is in line with findings from other studies (Brinkman & van der Geest, 2003; Lappalainen, 2010; Laverty, 1979). Interestingly, Cook (2002) includes critical analysis in writing process, where students are expected to complex writing situations. This skill appears to be relevant because in technical field, employers are expected to critique and evaluate written reports and to provide solution to a problem (McMurrey, 2002; Mitchell, 1962).

Secondly, rhetorical literacy is viewed as abilities to "…conceptualize and shape documents whatever their specific purpose and audience." (Cook, p10, 2002). Hence, the teaching and learning should be focussing on developing knowledge and understanding on the importance of employing a right discourse, content of writing or oral presentation, applying appropriate invention strategies depending on the audience, purpose and situation, and knowing their personal and audience's stance. Clearly, these elements extended what have been proposed in Rus's (2014) framework, especially in defining and understanding context, audience and purpose of technical communication.

Thirdly, social literacy focuses on developing collaborative skills. Many researchers have similarly acknowledged the importance of group skills in technical field (Lappalainen, 2010; Marshall, 1982; Rus, 2014). Cook (2002) highlights that teaching and learning experiences of technical communication course should encourage collaborative activities in order to train students to work effectively in a team, understanding the importance of interpersonal communication, and handle conflicts within group effectively. Importantly, she also suggests that students should be able to analyse the discourse of the audience. Significantly, McMurrey (2002) noted that an effective communication in technical field should allow the proposed idea to be pitched at the right level in order to convince the audience. Therefore, these elements under social literacy are important to technical field.

On the other hand, Cook (2002) suggests the development of technological literacy to enhance technical communication. She describes that the twenty-first century working field requires a strong foundation of this literacy. In achieving this, the institutions should help to create awareness of how these technological tools can help to improve communication process. This literacy is also related to other layers of literacy. In order to possess information-retrieving skills, students first need to be competent with technological tools. In addition, McMurrey (2002) and Mitchell (1962) have appointed the importance of visual aids to support communication in technical field. Therefore, Cook's (2002) suggestions are relevant to development of competencies in technical field.

Other than that, Cook (2002) proposed ethical and critical literacy as important elements to technical communication. Her argument is based on the belief that communication in technical field involves people from different cultural parties. Therefore, introduction to ethical cases during the teaching and learning is beneficial to help students to be more sensitive in what they presented during communication process. Lastly, critical literacy refers to ability to understand one's personal stance and the audience's stance. This process reflects Brinkman and van der Geest's (2003) idea of strategic thinking and genre competencies, where the abilities to organize information, structure arguments or ideas, and support arguments or ideas with logical and sound explanation are very prominent to technical field. Cook (2002) notes that this literacy helps to students to be more critical and sensitive in delivering ideas and opinion in communication settings.

In short, the discussion above has provided an in-depth description of the available framework of technical communication. Clearly, technical communication is a specific communication strategy that focuses on the process of analysing content, context, audience, purpose and forms of communication in order to promote an effective communication at work. Similarly, most frameworks generally agreed on the importance of information-retrieval skills, interpersonal and group skills, language competency and technical writing and oral presentations. However, in Cook's (2002) and Brinkman and van der Geest's (2003) work, other elements such as feedback competence, critical literacy and genre competence are fund to be relevant to the current needs of the current industry.

Technical communication skills based on the theories, models and current studies. Based on the review of literature, it is found that the Technical Communication theory (Mitchell, 1962) and model (Rus, 2014) have a close relationship to the Communication Process model (Dean & Byron, 1961). Hence, this section provides an in-depth description of this relationship, and discussion on the roles of language competency to technical communication. In the last section, a discussion on the technical communication skills based on the available models is provided in order to help categorized all the skills into four clusters of technical communication skills (interpersonal skills, oral technical communication skills, written technical communication skills, and researching skills).

The relationship between Technical Communication theory and models and Communication Process model. At this point, it is clear that technical communication falls under general communication theory. In Dean and Byron's (1961) communication process model, they have highlighted the importance of developing "language system"- the reception and transmission skills- to an effective communication process. Also, they have highlighted the general concept of communication where it should focus on the content and purpose of communication. Figure 2.16 below represents a number of similarities between general communication theories (communication process, group communication and organization communication).

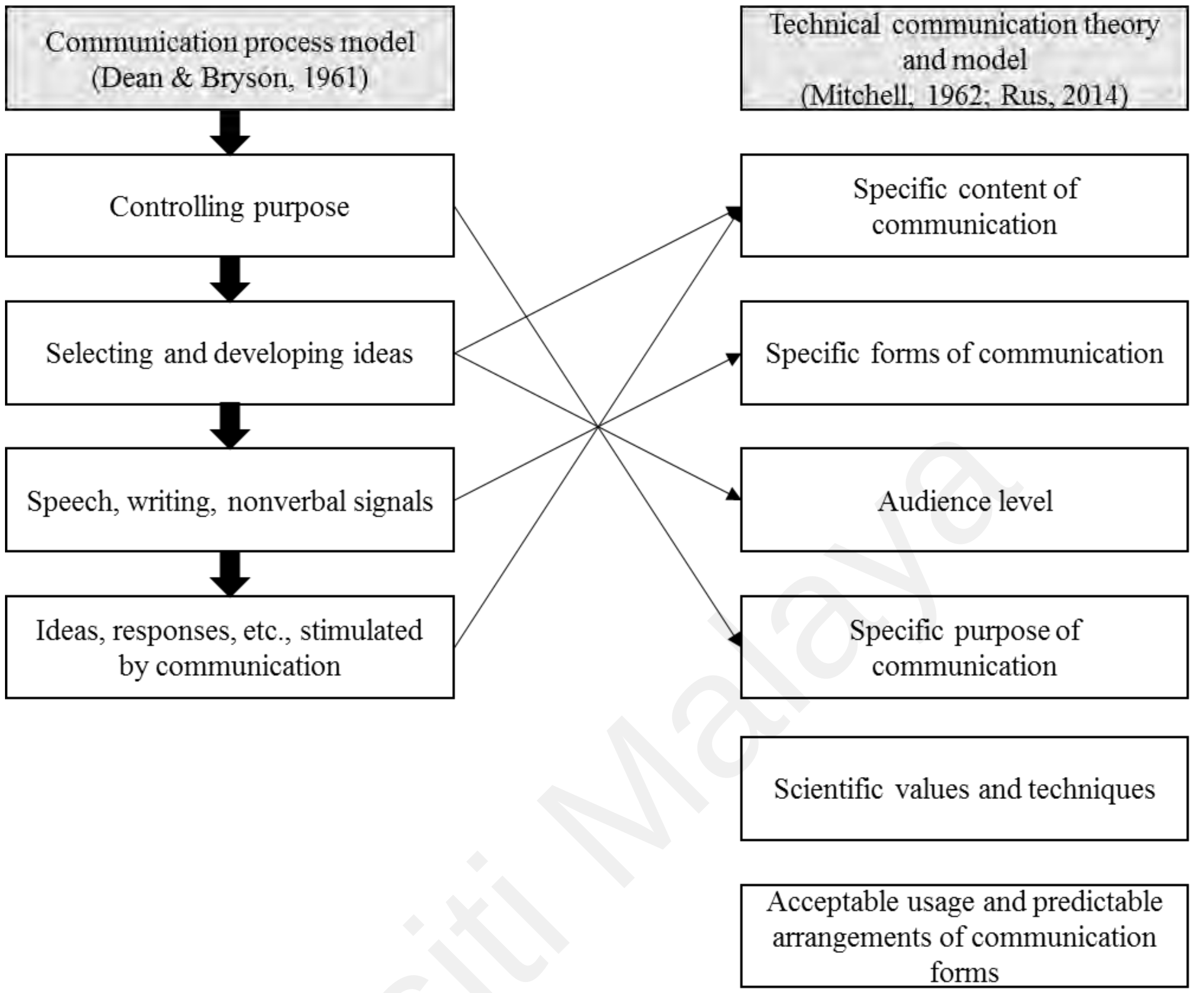


Figure 2.16 Similarities between the Communication Process model and Technical Communication theory and model.

In the above figure (Figure 2.16), it is apparent that the Communication Process model (Dean & Bryson, 1961), which provides a detailed description of communication process, shares similarities to Technical Communication theory (Mitchell, 1962) and model (Rus, 2014). In the process of communication, the communicators will start with establishing purpose of communication. Both general and technical communication theory highlighted this. However, in the Technical Communication theory, Mitchell (1962) mentioned that the communication in technical field focuses on specific purpose in completing technical tasks. Rus (2014) further elabourated that the purpose of this communication is not restricted to conveying information only, but also includes persuasion, instruction, entertainment, open new possibilities, propose changes, establish credibility, refute opposing ideas, community building, and others. In the second phase, “selecting and developing ideas”, the Communication Process model only explains the actions of communicator (speaker) to select and develop ideas based on the established purpose of communication. On the other hand, in the Technical Communication theory, Mitchell (1962) emphasized on the importance of understanding the audience’s background in designing the content of communication. Other researchers, such as Brinkman and van der Geest (2003), Cook (2002) and Lappalainen (2010) agreed that these two elements are very important to an effective communication. As the result, in their study, they have provided the content of learning that helps to develop the ability to understand the audience and develop an appropriate content of communication for the audience.

In the last two phases of the Communication Process model, Dean and Bryson (1961) highlighted the process of selecting appropriate forms of communication and its content. This is similar to the Technical Communication theory. However, in the work of McMurrey (2002), Mitchell (1962) and Rus (2014), they have provided a detailed guideline of types of technical communication and its suitability to different communication purposes in technical field. For instance, in written technical communication, research reports, user guides, consumer literature and technical journalism are among documents that are regularly used as communication means in this field. Each type of document has a specific purpose and can be used to achieve its specific communication purposes, and each document type has its specific format, techniques and arrangements as described by Mitchell (1962). This point leads to the other two characteristics of technical communication which are not available in the general communication scheme. According to Mitchell (1962), technical communication applies scientific values and techniques, where all the produced documents used in this field must follow fixed formulas and patterns, and the data (for research reports and other relevant documents) must be presented the prescribed layout. In addition, the arrangements of content of a communication is very important to technical communication. McMurrey (2002) emphasized that the content of a presentation (either in written or oral form) be logical and ease the audience's understanding. This characteristic is very pivotal to technical communication and recent studies have highlighted it as an important skill to be developed in technical communication course (Brinkman and van der Geest, 2003; Cook, 2002; Lappalainen, 2010).

The importance of English language proficiency to technical communication skills development. In the Communication Process model, Dean and Bryson (1961) have highlighted the importance of the "Language system" to communication. They further elaborated that language skills (reading, writing, listening and speaking) should be developed effectively in order to achieve an effective communication process. In other literature, Hošková-Mayerová (2014), and Klimova (2014) similarly agreed on this matter. They stated that language proficiency plays an important role to the development of an effective communication skills. In fact, a number of studies have exemplified the importance of language proficiency contribution to employability (Bleakley & Chin, 2004; Chiswick & Miller, 2014; Hošková-Mayerová, 2014).

According to Müller (2016), the proficiency in all four language skills: listening, speaking, reading, and writing, is very important to improve the quality of service among healthcare workers. The study suggested that these four language skills has a relative contribution to the development of proficient workers, especially in the area of communication skills in the workplace. Müller (2016) further elaborated that these language skills will help to develop communication skills that include the ability to communicate effectively with patients and other workers, and produce written documents that are relevant to the work field. Similarly, Yoo and Manna (2015) noted that all four language skills are the key determinant to an effective communication at work. In this study, Yoo and Manna (2015) reviewed the components in the Test of English for International Communication (TOEIC), especially on listening and reading. Among the skills highlighted under listening skills are the ability to comprehend and infer the information from a communication. On the other hand, the reading skills cover the ability to identify and understand the information, understand the vocabulary and grammar used in the text, and to make connection across information in different sentences. These skills are similar to Occupational English Test (OET) components, which is being largely practiced in Australia. According to OET (2016), among the components in assessing reading are the candidates' ability to locate and synthesize information from a text, comprehend them, and summarise the content of the text in their own words. For writing, candidates are expected to write a letter for clients or patients and other practitioners for a specific purpose at work. On the other hand, the listening and speaking component assesses candidates' ability to comprehend the content of a conversation and communicate effectively in English in a simulated conversation setting.

Specifically, Klimova's (2014) work has provided a clearer role of language proficiency to communication skills development. According to Klimova (2014), linguistic competence, which refers to the mastery of spelling, pronunciation of words, vocabulary, word formation and sentence constructions, as well as grammar, is very crucial in developing communication competency. To further illustrate its contribution to communication competency, Klimova (2014) has reviewed Uso-Juan and Martinez-Flor's (2006) work on the language skills (reading, writing, listening, and speaking skills) development. In developing communicative competence, Klimova (2004) stated that there are four other skills that should be given an equal emphasis in learning, which are pragmatic, intercultural, strategic and discourse competence. According to Klimova (2014), pragmatic competence refers to how and what language to use in achieving the goals of communication. Intercultural competence refers to ability to understand one's language and cultural background and conduct communication process accordingly. On the other hand, strategic competence refers to ability to strategize communication in order to achieve the communication goals. This also includes the process of structuring the content and to present it effectively. Lastly, the discourse competence refers how to structure ideas and use different genres to present oral and written communication. Klimova (2014) noted that the discourse competence is the root of all other competences because the ability to structure the ideas and use the genres is the foundation for other competences. She further linked these competences to language skills based on Uso-Juan and Martinez-Flor's (2006) work, where the competences are achieved by developing the language skills. This is similar to Dean and Bryson's (1961) notion, where the development of language skills is the foundation to communicative competences. This is illustrated in the Figure 2.17 below.

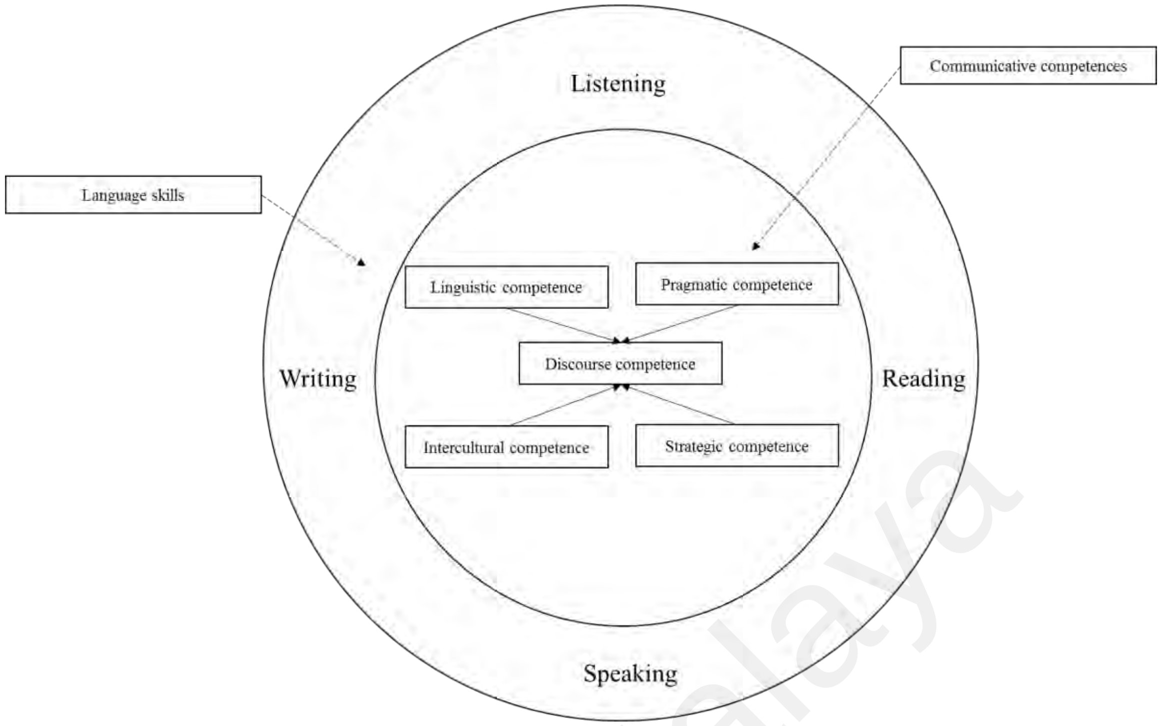


Figure 2.17 The language skills and communicative competences.

Based on the above figure (Figure 18) it is relevant to state the linguistic competence is equally important to communicative competence. The linguistic competence will contribute to discourse competence because it sets the foundation to develop content organization and genre used in the communication. Hence, poor linguistic competence will affect the communicative competences. Chiswick and Miller (2014) noted that linguistic competency has a positive relationship on employability. Their study reviewed the relationship between language skills of the target language among immigrants in Australia, Canada, Germany, Israel, United Kingdom, United States and Spain, and their earnings. The overall findings suggested that the immigrants who are proficient in English earned better than less proficient immigrants. As the result, some countries, except the United States have established English language proficiency as one of the requirements for permanent resident visa application (Chiswick & Miller 2014).

In short, language proficiency plays an important role to communicative competences. The communicative competences have a close relationship to technical communication skills. All five competences (linguistic, pragmatic, discourse, intercultural, and strategic competence) are the core skills in technical communication skills. In the previous section (Technical Communication theory), it has been highlighted the technical communication skills based on theory and models that have been practiced in different TVET institutions. For instance, the Brinkman and van der Geest's (2003) model have highlighted the importance of developing genre competency, strategic thinking and text craftsmanship for technical communication skills development. Clearly, genre competency and text craftsmanship are related to discourse competence, where the understanding of how to organize the content and how to use technical conventions for both oral and written communication is very prominent to effective communication. In addition, the strategic thinking reflects strategic competence for communicative competence. Brinkman and van der Geest (2003) noted that strategic thinking skills are the ability to analyze communicative situations and organize content of communication ton suit communicative goals. Also, the importance of pragmatic and intercultural competence is similarly being highlighted in Cook's (2002) model of technical communication. Cook (2002) noted that social literacy concerns on the ability to work effectively with people from different cultural backgrounds. In addition, the pragmatic competence can be related to basic and rhetorical literacy in Cook's (2002) model. The knowledge of how to use the language to achieve communicative goals is very prominent for technical communication. On the other hand, the linguistic competence underlies all the skills of technical communication. In technical communication, the oral and written communication skills require individuals to be able to apply basic literacy – the linguistic competence – in presenting ideas in communication (Brinkman & van der Geest, 2003; Cook, 2002; Lappalainen, 2010). In fact, the importance of linguistic competence has been represented in the Communication Process model (Dean & Bryson, 1961). Therefore, in developing technical communication skills, linguistic competence should be developed simultaneously.

The skill clusters of technical communication. On the other hand, in the previous section, the Technical Communication Theory, it has been deliberately discussed the elements of technical communication scheme. As appointed by Rus (2014), the technical communication scheme is more specific to technical field as it emphasizes on the understanding of the target audience and its relationship, specific purposes of communication and the context of communication at work. This is in line with an earlier theory proposed by Mitchell (1962), where he mentioned that the elements of technical communication reflect the needs of communication for technical and scientific working context. Interestingly, Lappalainen (2010) associated technical communication with English education. In his study, he tried to explore all 15 themes of English education (such as grammar, pronunciation, industrial, strategy, financial and business terminology/jargons, technical and academic writing, ethics, CSR, environmental and cultural awareness, corporate, interpersonal and leadership communication, and meeting and negotiation skills) and found that 'meeting and negotiation', 'leadership and managerial communication', 'technical writing' and 'interpersonal communication' as prominent elements of communication skills in technical field. Brinkman and van der Geest's (2003) has expanded these skills by proposing four layers (text craftsmanship, genre competence, strategic thinking, and feedback competence) of communication skills, which are deemed to be pivotal to working field. Also, Cook (2002) has similarly proposed six types of literacy to technical communication, which includes basic, rhetorical, social, technological, ethical and critical literacy. However, other studies have simplified all technical communication skills into four important clusters of skills, which are interpersonal, oral and written technical communication, and researching skills (McMurrey, 2002; Rus, 2014; Tabbron & Yang, 1997).

Based on Figure 2.18 below, the elements in both frameworks can be categorized into four main clusters of skills, which are interpersonal, oral technical communication, technical writing and researching skills. In Brinkman and van der Geest's (2003) study, the text craftsmanship serves as a foundation to written and oral technical communication skills. They specifically highlighted the importance of developing a strong foundation of information searching skills, building logical arguments based on the relevant resources, designing documents or presentations suitable to the target audience. In the genre competence, Brinkman and van der Geest (2003) stated that the understanding of how to organize and represent the content of a presentation in either oral, written or visual form, are very prominent in the working field. Therefore, these skills can be linked and practiced in either oral communication or writing skills. On the other hand, the strategic thinking skills are applicable for all skill clusters. According to Brinkman and van der Geest (2003), strategic thinking is a foundation to achieve targeted purposes of a communication. In strategic thinking, they highlighted the importance of understanding communicative situations, analyzing the supporting details to support a case, and awareness of ethical issues in technical field. Lastly, the feedback competence skills can be applied in interpersonal, oral communication and writing. As outlined by Brinkman and van der Geest (2003), the feedback competence is important to help advancing a company. This is because the ability to give and gather feedbacks to/from other workers and customers are beneficial in improving quality of work.

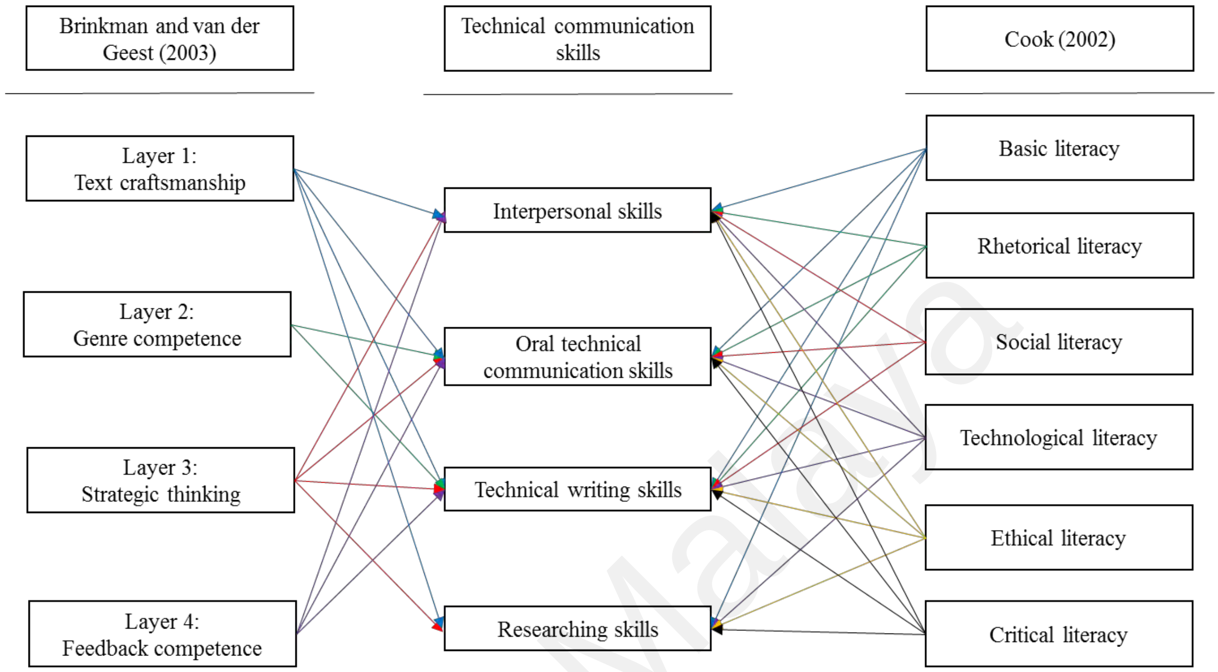


Figure 2.18 The technical communication skills clusters.

On the other hand, in Cook's (2002) technical communication framework, he represents technical communication based on six types of literacy. The basic literacy refers to foundation skills of reading and writing, with an integration of information-searching skills. As presented above, the basic literacy is embedded across all skills clusters. Similar to Brinkman and van der Geest's (2003) framework, the importance of basic skills in text craftsmanship and strategic thinking is similarly emphasized and underpinned interpersonal, oral technical communication, technical writing and researching skills. Secondly, rhetorical literacy can be linked with interpersonal, oral technical communication and writing skills. This is because this literacy refers to the ability to produce documents or information tailored to the specific audience and with specific purposes. This literacy is very similar to text craftsmanship and genre competence in Brinkman and van der Geest's (2003) framework. On the other hand, social literacy refers to communication in collabourative settings. This skill is closely related to interpersonal, oral technical communication and writing skills in technical field. Cook (2002) added that social literacy covers the ability to analyze and understand the use of different discourses for different audience. This reflects genre and feedback competence in Brinkman and van der Geest's (2003) framework. Interestingly, Cook (2002) proposed technological literacy as an important skill to technical communication. He believes that communication in technical field requires the use of technology either in gathering relevant resources or to transmit the information to a larger population. Therefore, technological literacy is seen to be the base of all four clusters of skills. On the other hand, ethical literacy refers to ability to understand the background of audience and working field in communication. Cook (2002) believes that communication in technical settings involves multiple parties, and thus ethical issues relevant to the audience and field should be addressed. Ethical literacy is therefore important to all clusters of skills. Lastly, Cook (2002) similarly highlighted the importance of critical thinking in his framework. According to him, critical literacy refers to ability to organize content of communication by providing solid justifications and details to maximize its outputs. This process includes researching for resources, organizing materials, providing logical arguments and structuring presentation to suit the audience. Therefore, this skill is seen to be the foundation of all four skills clusters.

Of importance, the proposed clusters of technical communication skills reflect both Group Communication and aOrganization Communication theory. The Group Communication theory (as proposed by Bales (1950)), represents the types of messages that are typically used in a group communication. Whereas, the Organization Assimilation theory (as proposed by Jablin (1987)) explains the process of communication involved in the process of adjusting and being part of an organization. Both theories have direct relationships with interpersonal skills of technical communication, and oral and written technical communication skills. Previously, it has been presented that the interpersonal skills are related to text craftsmanship, strategic thinking, and feedback competence skills (in Brinkman and van der Geest's (2003) framework) and basic, rhetorical, social, technological, ethical and critical literacy (in Cook's (2002) framework). In both frameworks, Brinkman and van der Geest (2003) and Cook (2002) highlighted the importance of acquiring a strong foundation of communication skills in retrieving information, constructing content, and communicating information to target audience. Therefore, in this process, the positive/negative and mixed actions, and questioning and answering, as represented in Bales's (1950) theory will take place. In addition, the interpersonal, oral technical communication, written technical communication and researching skills will take place in all stages in the Organization Assimilation theory, especially in the "Encounter" and "Metamorphosis" stage. This is because, in both stages, the main communication purpose is to give contribution and achieve organizational goals ((Dahm, et al., 2015; Nagendra et al., 2013; Wellington, 1993). Therefore, there is a need to develop all four clusters of skills because these skills comply with both communication theories.

In short, past studies have agreed on the importance of developing interpersonal, oral technical communication, technical writing and researching skills as important skills to technical communication. Both frameworks (Brinkman & van der Geest, 2003; Cook, 2002) have provided a detailed description of sub skills to each cluster. Therefore, the technical communication skills clusters as presented in Figure 19 above are relevant to be used as a foundation to develop technical communication among vocational college students.

Curriculum development theory. This section presents a discussion on Tyler's (1949) curriculum planning model and its relevance to the current study. Also, in relation to the current study, Tyler's (1949) model is used as the foundation for the development of an industry-based technical communication pedagogical model in Malaysian Vocational Colleges.

Tyler's (1949) curriculum planning model. Tyler's (1949) curriculum planning model is a beacon in curriculum development history. In this model, the grand tour questions are represented in four phases of curriculum design (Figure 2.19). Marsh (2009) describes 'objective' as the purpose or aims of the curriculum and it is then translated into the selection of content, context, anticipated students' satisfaction, sufficient learning opportunities and overall satisfaction by performing the trained behaviour. In selecting learning behaviour, Tyler (1949, as cited in Ross, p.119, 2000) highlights five guiding principles, which are:

a. students must have experiences that give them opportunities to practise the desired outcomes;
b. students need to achieve satisfaction through the behaviour that is the desired outcomes;
c. it must be within the student's capabilities to achieve the desired behaviour;
d. different educational experiences might be used to attain the same objective; and
e. the same educational experience might have several different outcomes.

In the next stage, all of these elements will be organized and represented in the form of solid curriculum and will be evaluated on its effectiveness. Ross (2000) added that the organization process must reflect the aforementioned principles in the produced material. What he meant by 'material' is the content of the curriculum. Ross

(2000) continues to reinforce the organizing learning experience "…through breaking down the material into a logical progressive development of the understanding or skill…" (p.119) in order to shape students' behaviour to be parallel with the desired objective.

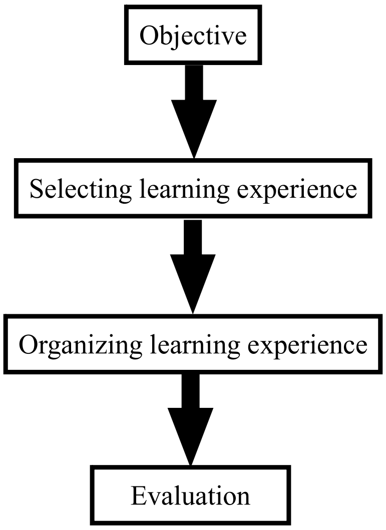


Figure 2.19 Tyler's (1949) planning model.

Tyler's (1949) planning model is one of the widely practiced in curriculum design. However, Nunan (2016) plotted some arguments against this model. Mainly, the linear process of curriculum model seems to be inaccurate to represent this process. Also, the simplicity of this model has opened up room for arguments on its end product (Nunan, 2016). The evaluation process only happens at the end of the process, reflecting poor curriculum planning and restructuring process. For instance, Clark (1985) argues that evaluation of the curriculum should take place at every phase in ensuring its effectiveness.

In the work of Stenhouse (1975), the major emphasis was given on evaluation process in every stage of curriculum development. Stenhouse (1975) describes curriculum development process in three major elements: planning, empirical study, and justification. Nunan (2016) further describes planning as selection of principles for content, teaching strategy, reviewing the learning sequence, and evaluating the strengths and drawbacks of students' learning experience and the aforementioned process. Curriculum should also consider the empirical study, especially on the principles for evaluating students' and teachers' progression, and suitability of the curriculum across different contexts and its effects. Finally, the aim and intention of the designed curriculum should allow continuous scrutiny for its improvement and effectiveness (Nunan, 2016). Clearly, the work of Stenhouse (1975) on the major elements in a curriculum model has provided alternative to the weaknesses in Tyler's (1949) planning model. Interestingly, the objectives of an intended curriculum must "…be accessible to critical scrutiny." (Nunan, p.13, 2016).

In the current study, Tyler's (1949) curriculum planning model is one of the prominent theories to guide the development of an industry-based technical communication pedagogical model for Malaysian Vocational Colleges. The main strength of this model is in its focus and organization in developing curriculum. According to Marsh and Willis (2007), this model is "prescriptive" in the sense that the expected results of the curriculum development are used to guide the selection of learning objectives and learning experiences, organization of learning experiences, and the evaluation of the learning experiences. This is in line with the general concept of TVET curriculum, which is characterized as 'objectives-driven' curriculum because it is aimed to address social needs through education (Ross, 2000) (further discussed in Chapter 2: Curriculum Development).

Primarily, Tyler (1949) mentioned that in selecting learning objectives, there are three important sources of information that should be used in guiding its development, which are: a) understanding of learners, b) understanding of the environment outside school, and c) opinions of relevant experts or subject specialists on the possible objective of the curriculum. In context of the current study, this information are the basis for the pedagogical model development. In establishing the learning objectives of the pedagogical model, the importance and contribution of communication skills to the work field are being analyzed based the literature. Also, in establishing the relevant learning objectives, this information is reviewed by the experts from the industry and academicians. The experts' opinions are very relevant because their insights on the importance and contribution of technical communications for the work field are derived from their personal experiences in the industry (the industry experts) and from the point of view of the education practitioner (the academicians). Hence, this approach is in line with Tyler's (1949) notion of integrating the information from the environment outside the school and experts' opinions on this matter.

Secondly, Tyler (1949) emphasized on the importance of analyzing and developing content of learning in translating the established objectives. Marsh and Willis (2007) mentioned that, in achieving this, a careful analysis of expected skills to be developed based on the learning objectives and possible ways to develop it must be carefully organized. Similarly, in this research, this process occurs in the needs analysis phase. The experts' views and opinions on the relevant content of learning are used in selecting the relevant learning experiences for the students. Also, in the process of organizing learning experiences, Tyler (1949) highlighted three prominent criteria in achieving this, which are continuity, sequence and integration of the lessons. Specifically, in the current study, these criteria are relevant in the process of organizing learning experiences for the development of the pedagogical model. For instance, the continuity, sequence and integration of technical communication skills development in the pedagogical model starts from the introduction of basic communication skills to more specified skills. Based on the review of literature, it is found that there are four main skills in technical communication: interpersonal, researching, oral technical communication and technical writing skills (Brinkman & van der Geest, 2003; Reaves, 2004; Rus, 2014). Each skill has a set of sub skills that vary in their level of difficulties. Hence, in introducing each skill, a careful organization on the content or focus of learning needs a careful analysis. In addition, in ensuring the effectiveness in its delivery, the selection of relevant methods of teaching is done based on the review of the literature and later is being compared with responses by the English language instructors in Malaysian Vocational Colleges. This approach is also similar in selecting the evaluation process of teaching and learning process. According to Marsh and Willis (2007), the evaluation process is very important in ensuring the outcomes of teaching and learning are in line with the established objectives.

In short, the concept of “prescriptive” or “goal-oriented” curriculum development process as highlighted in Tyler’s (1949) model seems relevant to the current study. This is because, the main purpose of the development of the pedagogical model is to help overcome the poor communication skills among TVET students in Malaysia. Taking this as the general goal of the model, the selection of components of the curriculum (the focus of learning, learning content, delivery method and learning assessments) for this pedagogical model be done through the review of literature, especially on the current practices in developing students’ technical communication skills in other TVET institutions outside Malaysia (refer Chapter 2: Technical communication curriculum in prominent TVET institutions) and later, is being validated based on experts’ opinions and through the analysis of Structural Equation Modelling. Therefore, it is relevant to state that Tyler’s (1949) curriculum planning model is pivotal to the development of an industry-based technical communication pedagogical model for Malaysian Vocational Colleges.

The Pedagogical Model and Its Importance. Batista et al. (2010) stated that pedagogical model is crucial to teaching as it represents relevant teaching and learning theories in a comprehensive manner for teachers to practice them in classrooms. Watkins and Mortimore (1999) mapped the different views of teaching pedagogy from different literature starting from 1939. In the earliest phase, Phase 1, Watkins and Mortimore (1999) mentioned that the practices of teaching pedagogy mainly concern on teachers’ roles. They further reviewed studies in 1939 to 1987 (such as in Anderson & Brewer, 1946; Barker Lunn, 1984; Bennet, 1976; Bennet & Jordan, 1975; Cuban, 1984; Galton, 1987; Lewin, Lippit & White, 1939) and found that the main focus of teaching pedagogy in that era is on the roles of a teacher in teaching and learning. The review of literature indicated that teaching styles have an influential impact on students’ learning success. The conception of teaching styles, such as ’authoritarian’ ‘democratic’ or ‘laissez-faire’, has then been developed and widely used as the basis to develop a sound pedagogy. Watkins and Mortimore (1999) added that in later stage (starting 1975 and above), the focus has shifted to characterizing an excellent and poor teacher. This serves as a guideline for practitioners in conducting an effective teaching and learning process.

In the second phase, Watkins and Mortimore (1999) noted that the studies in early 90's started to view teaching pedagogy from the contexts of teaching. Watkins and Mortimore (1999) stated that the studies in this era (such as Arends, 1994; Doyle, 1990; Cuban, 1993) started to link the goals of teaching with the appropriateness of learning tasks, resources, time and pacing, role, and social structure. These elements are very crucial to learning success because it will determine the kinds of teaching and learning that are relevant to be implemented, and the ability of teachers to adapt and modify their teaching in accordance to the students and school's background. Watkins and Mortimore (1999) affirmed that in this second phase, the teaching pedagogy is no longer unidimensional (focusing on teaching styles) but has expanded in building teacher's understanding of students and school's context, in developing learning.

On the other hand, in the third phase, Watkins and Mortimore (1999) noted that development of pedagogy is based on teaching and learning. Studies such as Bruner (1996) and Cox (1997) viewed students as thinkers and knowledgeable individuals. This belief has led to the development of pedagogy that is majorly focusing on expanding students' knowledge and to help them to link what they already know with the new knowledge introduced in the classroom. In order to achieve this, the concept of active learning, independent learning, meta-learning and collaborative learning are found to be crucial to develop students' knowledge. Other than that, Watkins and Mortimore (1999) noted the pedagogy in this phase has placed the importance of integrating additional resources to support teaching and learning.

Learning is not only restricted to what is presented by the teacher but expands to other relevant sources outside the classroom. The belief that students should be able to learn independently and conduct meta-learning has made the teaching pedagogy more dynamic and student-centered. However, Cox (1997) cautions that this belief is only applicable if the students were able to accurately build their own understanding of the accessed resources. This means that, the pedagogy should also consider other important aspects of teaching and learning in developing the foundation to active learning, independent learning, meta-learning and collaborative learning before allowing students to learn on their own.

Based on the above discussion, it is apparent that the shift of focus in teaching pedagogy (based on the literature) has made teaching pedagogy more dynamic. Starting from the earliest stage, the development of teaching pedagogy only concerns on teaching styles and characterizations of an excellent teacher as guidelines for an effective teaching. Later, the focus of teaching pedagogy shifted to understanding the context of teaching, in which teaching methods play a crucial part to the success of the learning. The understanding of students and school context is also important to help teachers to modify and develop lessons that are more appealing and effective for students. Lastly, in the third phase, the pedagogy concerns on teaching and learning process, where students are viewed as thinkers and knowledgeable individuals. Hence, the teaching and learning process should allow students to explore new knowledge and learn collaboratively in class. However, what has been viewed so far is only from the researchers' perspectives. In the concept of developing pedagogy, Watkins and Mortimore (1999) mentioned that practitioners' views are similarly important. Since the pedagogy is designed for teachers, their views are equally important to further develop an effective learning setting. By far, we already learned that pedagogy should consider the relevant aspects or components of teaching and learning. According to Husin and Aziz (2004) pedagogical model primarily concerns on the concept of teaching and concept of learning. In explaining the concept of teaching, Husin and Aziz (2004) views teaching as a process of communicating knowledge. As illustrated in the figure below (Figure 2.20**),** the process of communicating knowledge starts from teacher. Teacher plays an important role as knowledge provider. However, the role of knowledge communicator does not necessarily from teacher because sometimes in learning process, knowledge transfer happens even from students. Typically, in teaching and learning process, the teacher, with her knowledge of the field, will present the content of learning in the class verbally or with support with other resources as platform to conveying information. Lastly, the recipients will receive the messages and comprehend them. In a bigger picture this process reflect Dean and Bryson's (1961) communication process model as interaction can be initiated by both teacher and students.

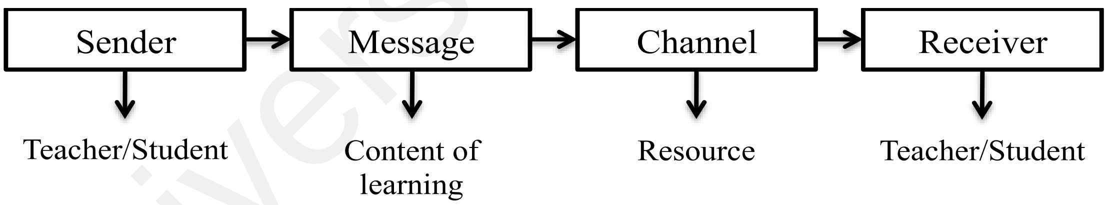


Figure 2.20 Communication process in learning model.

Based on this general concept-teaching as process of communicating knowledge- Glaser's (1962) instructional model is very relevant in explaining the importance of developing pedagogical model for an effective teaching and learning process. The underpinning theories to pedagogy is derived from teacher's perceptive on teaching, students' perception of learning, delivery of teaching, and content and context of learning (Batista et al., 2010; Husin & Aziz, 2004). In Glaser's (1962) model, he specifically emphasized on the importance of organizing instructional objectives, strengthening students' entering behaviour developing appropriate instructional procedures and performing assessment.

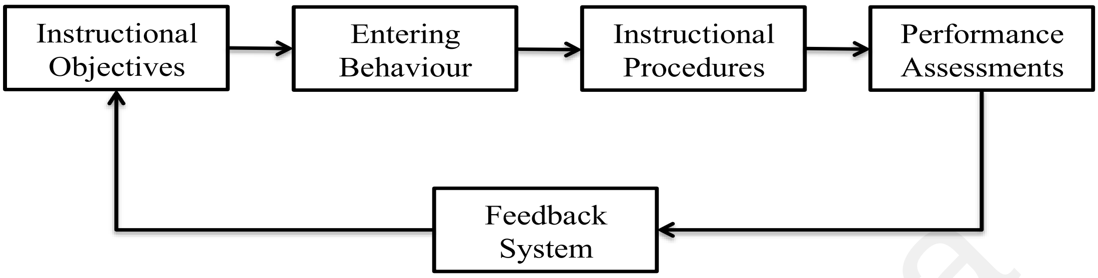


Figure 2.21 Glaser's (1962) instructional model.

As presented in Figure 2.21 above, Glaser (1962) views instructional objective as an important element to learning process. Instructional objectives are the expected learning outcomes that also serve as a guideline to selecting teaching method and assessment. However, Glaser (1962) states that the instructional objectives should be tailored based on students' entering behaviour and potential. In considering relevant instructional objectives, Husin and Aziz (2004) explain that teachers should consider students readiness to learn new knowledge, amount of background knowledge relevant to the new lesson, and students' strengths and weaknesses in learning process. These elements, in turn, will serve as a foundation for students to learn new knowledge with a strong reference on their previous knowledge, in order to achieve an effective learning process. In addition, in realizing the learning objectives, teacher will then select and organize appropriate instructional procedures. According to Glaser (1962), this process must be carefully designed as it will determine the success of the learning process. Husin and Aziz (2004) added that in designing and organizing an effective instructional procedure, teachers should also consider students' learning capabilities, motivation and learning environment. On the other hand, in assessing the success of the learning process, performance assessment should be conducted. Glaser (1962) stated that the assessments must be designed based on the content of learning. A successful lesson is when the students were able to perform excellently in the assessments, and simultaneously indicating that they have achieved the learning objectives. Lastly, the feedback system is the overall process of evaluating the learning process. According to Husin and Aziz (2004), in the process of conducting lessons, teachers should constantly analyze students' entry behaviour, performance and responses, instructional strengths and weaknesses, and appropriateness of the assessments and students' actual performances. This information are very crucial for teachers in order to improvise students' learning process and the outcomes of learning.

On the other hand, Hallam and Ireson (1999) has outlined the important elements to be considered in developing a sound pedagogy for secondary school. In his work, he referred to Simon (1997) and Uljens's (1999) work in framing the foundation of a sound pedagogy, which includes six foundation elements: a) aims of education or learning, b) theories of learning, c) conceptions of teaching, d) models of teaching and learning, e) understanding on how to operationalize the aforementioned elements, and f) assessments to evaluate teaching practices. The aims of education shape the direction of teaching and learning. According to Hallam and Ireson (1999) the aims of education are depending on political, social, community and economic factors of a country. Linking this to the Malaysian context, the Malaysia Education Blueprint 2013-2025 (MOEM, 2012) highlighted the importance of producing future skilled workers through an organized and effective training in Malaysian TVET institutions. This is because the unemployment rate in Malaysia, especially among graduates from secondary and tertiary education has increased over the years (Department of Statistics Malaysia, 2015). Hence, the education is believed the best platform to prepare students with relevant skills that are needed by the current industry.

In realizing the main objectives of education, teachers' knowledge and understanding of learning theories are very prominent. Hallam and Ireson (1999) mentioned that learning is a continuous process. However, he further argued that teachers' understanding about learning continues to be incomplete over the time. This is because the teaching approaches and strategies differ from one context to another. Hence, teacher's understanding and knowledge of theories of learning are very important in order to adapt to the changes of classroom settings, and students' characteristics and background (Alias, Nordin, Siraj, Abdul Rahman, 2014; Cox, 1997). Thirdly, the conceptions of teaching are related to how the teaching process is being viewed, conceptuaized and practiced in classroom settings. Hallam and Ireson (1999) highlighted that the conceptions of teaching mirror the learning process. What is being presented in teaching is being reflected and practiced in students' learning environment. The conceptions of teaching have a close relationship with the objectives of education. These objectives will later be translated into teaching process, which in return will shape the process of learning. Hallam and Ireson (1999) mentioned that conceptions of teaching in secondary school are not majorly based on transferring and developing academic skills. In line with the current needs of the society and National Education aspirations, the process of teaching must not be restricted only to academics but also developing relevant skills that are helpful for students for their future work field. This is very similar to what is being practiced in TVET institutions in Malaysia. As outlined in the Malaysia Education Blueprint 2013-2025 (MOEM, 2012), the revamp of TVET is aimed to produce future workers who are knowledgeable and skilful, in order to meet the demands of the current industry. As the result, TVET institutions in Malaysia have undergone numerous changes on its focus and delivery. For instance, in the early years (1905 to 1960), TVET institutions in Malaysia only aimed to provide training for workers and provided limited exposure to students in learning in vocational schools. According to Emat (1993), the conceptions of TVET have shifted starting from 1960, where vocational education was given a major emphasis in mainstream education. As the result, a number of TVET institutions were established, including Polytechnics. Until recently, the number of TVET institutions has increased; to date, there are 81 vocational colleges in Malaysia. These colleges together with other TVET institutions, such as Polytechnics, and other training institutes (Industrial Training Institutes (Institrut Latihan Perindustrian, ILP), GiatMARA, Institut Kemahiran MARA and others) have been established to offer various technical courses. The underpinning conceptions of these institutions are to develop academic and technical knowledge and equip students with a strong foundation of technical skills.

In realizing the objectives of education, it is also important to ensure that teachers are well equipped with knowledge of an effective teaching and learning models. Hallam and Ireson (1999) stated that the knowledge will help teachers to be more sensitive towards students' characteristics, learning needs, and learning environment, as well as to be efficient in designing and establishing a supportive learning environment for the children. In achieving this, the aforementioned elements (the understanding and knowledge of objectives of education, theories of teaching, and conceptions of teaching) along with other two elements: the understanding on how to operationalize these elements and developing appropriate assessments to evaluate teaching practices are very vital. In conceptualizing this complex process, Hallam and Ireson (1999) has proposed a framework to represent the process of teaching and learning in secondary school settings.

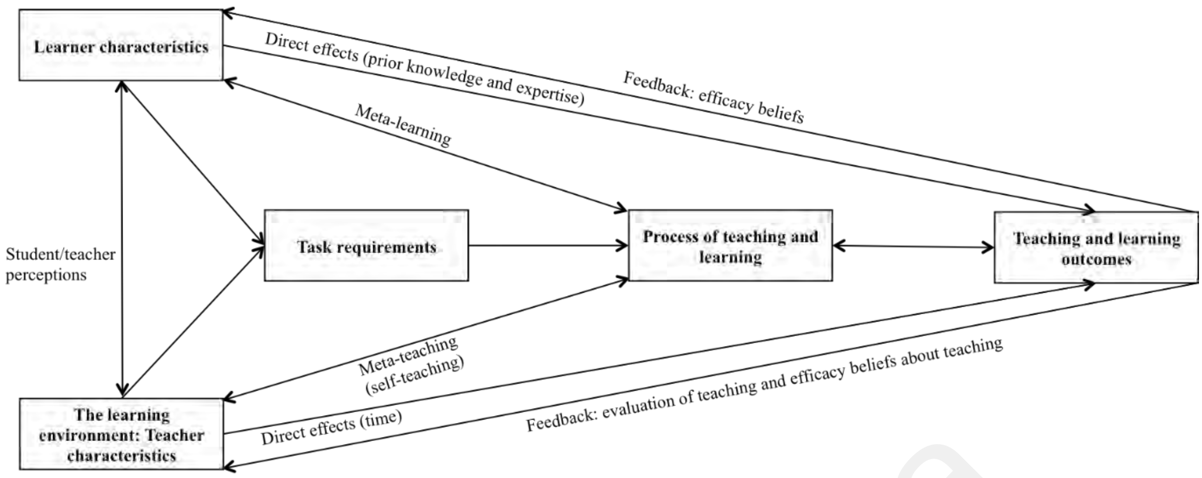


Figure 2.22 Hallam and Ireson's (1999) model of teaching and learning.

Based on the above figure (Figure 2.2), the learner characteristics and the learning environment (teacher characteristics) have a close relationship to the task requirement. Hallam and Ireson (1999) explained that in designing the task requirements, which aim to realize the objective of education, students' level of expertise, prior knowledge, learning styles, metacognition, motivation and self-esteem should be critically analyzed and considered in developing appropriate teaching and learning experiences. In achieving this, teacher characteristics, which refer to teacher's personal beliefs, expectations, self-efficacy, knowledge of teaching and planning are very important in matching students' needs for learning with the intended teaching and learning experiences. It is undeniable that teachers' knowledge and beliefs play an important role in realizing the aspirations of National Education, because they are the agents that translating the general education objectives at the micro level of practice (Alias et al., 2014; Batista et al., 2010). Their "professional characteristics" (personal beliefs, expectations, self-efficacy, knowledge of teaching and planning) are very important to ensure the practice of a sound teaching and learning process. In addition, both teacher and learner characteristics have a strong influence on the process of teaching and learning. According to Hallam and Ireson (1999), the process of meta-learning, which happens when students are thinking about their learning, and meta-teaching, (the thinking of teaching by the teachers) have a strong contribution on teaching and learning outcomes. When meta-learning occurs, students will be able to link what they already know with the content of learning, and thus achieve meaningful learning (Alias et al., 2014; Ornstein & Hunkins, 2009). On the other hand, the meta-teaching will help teachers to reflect and take actions to improve teaching, and in return will enhance the outcomes of the learning. In addition, Hallam and Ireson (1999) mentioned that the overall process of teaching and learning should be evaluated in order to improve its outcomes. The National assessment criteria, quality of learning, quantity of learning, and affective outcomes can be used to evaluate the outcomes of teaching and learning. In the localized context of Malaysian TVET, the National assessment criteria has been established, which highlighted the expected technical skills and competencies to be achieved according to the certification levels. For instance, in the Malaysian Skills Certification (Sijil Kemahiran Malaysia) as proposed by Department of Skills Development (2012), the Level 1 certification generally requires students to be competent in performing a range of various jobs or tasks that are mostly routine and predictable. Whereas, in Level 3 certification, students are expected be competent in performing a broad range of varied work activities that are performed in a variety of contexts, and most of them are complex and non-routine. In evaluating students' performances, Department of Skills Development (2012) has also outlined the criteria of evaluation and rubrics for each level of certification. The outcomes of this assessment is not only to ensure that students are able to master the minimum requirements but also to give ample exposure of real working environment that in turn will prepare them for real working world (Department of Skills

Development, 2012).

In short, what has been proposed by Hallam and Ireson (1999) is in line with Glaser's (1962) instructional model. The emphases on establishing learning objectives, understanding students' entry behaviour, developing instructional procedures, assessing students' performances, and gathering feedbacks on teaching and learning process reflect the components in Hallam and Ireson's (1999) model. The task requirements, which are based on the learning objectives, are being aligned with learner and teacher characteristics. The understanding of students' level of expertise, prior knowledge, learning styles, metacognition, motivation and self-esteem reflects the process of understanding students' entry behaviour. In addition, the process of developing instructional procedures is closely related to process if implementing teaching and learning in Hallam and Ireson's (1999) model. In achieving this, Hallam and Ireson (1999) emphasized the importance of relating learning objectives with students' background and teacher's professional characteristics in developing a sound teaching and learning process. Lastly, both authors exemplified the importance of evaluating the outcomes of teaching and learning in measuring students' mastery, which in turn will help to improve the teaching practices.

The Relevance of the Reviewed Theories to the Current Study

Previously, in Chapter 1 (the Statement of Problem), it has been discussed the importance of focusing on the implementation phase of curriculum as it will determine its successfulness in realizing the curriculum. Marsh and Willis (2007) and Batista et al. (2010) agreed that a pedagogical model is important as guidelines for curriculum implementers, which are the teachers. Generally, pedagogy is defined as "the science of teaching" (Watkins & Mortimore, 1999), which concerns on teacher's roles, teaching context, and teaching and learning activities. However, Watkins and Mortimore (1999) the term “science” should be treated with caution. They further explained that in context of teaching practices, the “science of teaching” involves meticulous process of imparting knowledge, developing and facilitating students’ understanding, altering their conceptions, and supporting their learning as proposed by Samuelowicz and Bain (1992). Therefore, teacher’s knowledge and ability play an important role in realizing the outlines processes. In achieving this, developing pedagogical model is vital. Batista et al.’s (2010) exemplified that pedagogical model is the representation of relevant theories. Therefore, in this study, the concept of pedagogical model can be represented as in Figure 2.23 below:

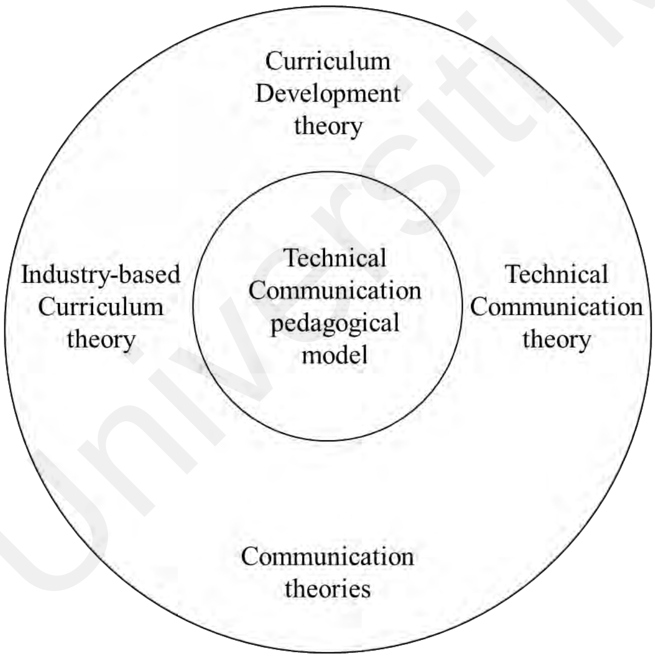


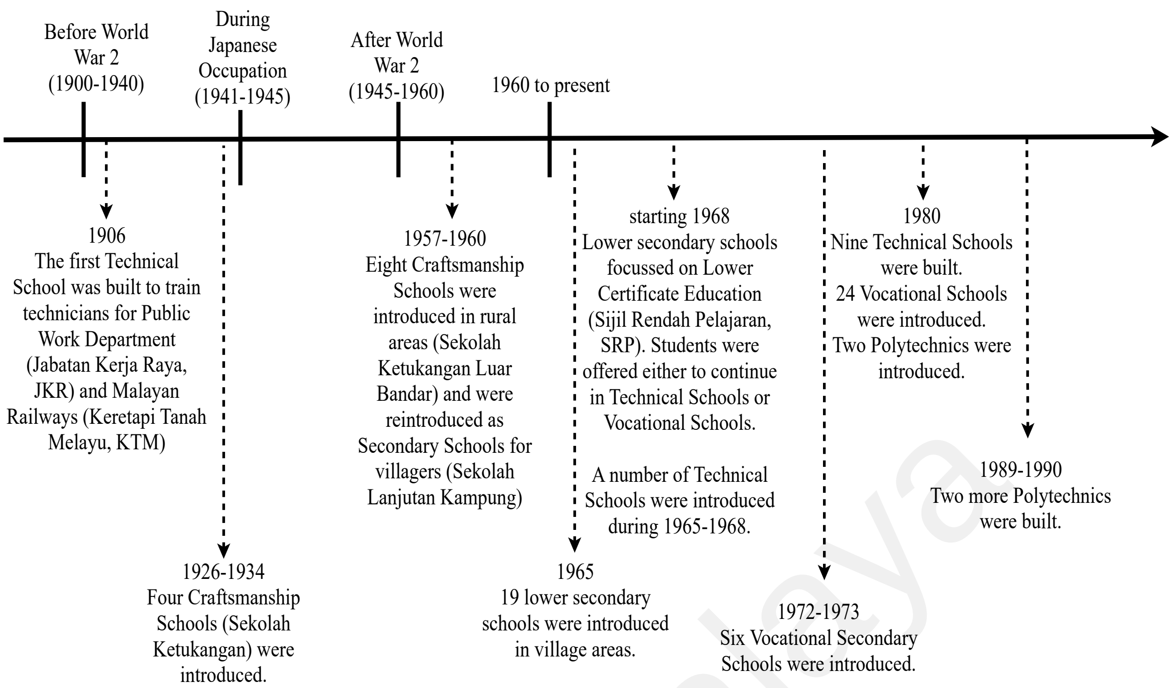
Figure 2.23 The representation of technical communication pedagogical model.

Applying a similar approach as outlined by Batista et al. (2010), the development of the Technical Communication pedagogical model will be based on four theories: a) Curriculum Development theory (Tyler, 1949), b) Technical Communication theory (Mitchell, 1962), c) Communication theories (Dean and Bryson's (1961) Communication Process model, Bales's (1950) Group Communication theory, and Jablin's (1987) Organizational Assimilation theory), and d) Industry-based Curriculum theory (Wellington, 1993). Therefore, the proposed pedagogical model focuess on the development of an industry-based technical communication skills through an effective implementation by the teachers. In achieving this, all four components in Tyler's (1949) curriculum theory (focus of learning, content of learning, method of delivery, and assessment method) are used as the foundation to the development of this pedagogical model. Also, based on the review of literature (Chapter 2, Technical Communication theory section) the possible elements for each component are used as the foundation to the pedagogical model and later tested in this study.

Technical and Vocational Education Training (TVET) in Malaysia.

This section offers a rich description and discussion on the developmental history of TVET in Malaysia, changes made in the vocational curriculum, and its content and context of teaching and learning. The discussion of the teaching and learning specifically focuses on the English subject, as it is believed to be the mean to develop language competencies and soft skills, in relation to the development of technical communication.

History of TVET development in Malaysia. The development of TVET has started even before the World War 2. Emat (1993) noted that the year 1906 was a turning point for technical education in Malaysia. The developmental history of TVET in Malaysia is represented in the figure below (Figure 2.24).



Adapted from Emat's (1993) work.

Figure 2.24 The developmental history of TVET in Malaysia.

During this period, the first technical school was introduced, aiming to provide relevant training for technicians from Public Work Department (Jabatan Kerja Raya, JKR) and Malayan Railways (Keretapi Tanah Melayu, KTM). Twenty years later, four Trades Schools (Sekolah Ketukangan) were introduced in Kuala Lumpur, Pulau Pinang, Ipoh and Johor Bahru (Emat, 1993; Rasul, Ashari, Azman & Abdul Rauf, 2015).

Each school was aimed to provide technical training for primary school students who are struggling in academic. These schools provided foundation technical training in the field of mechanical, electrical and carpentry. However, according to Emat (1993) these schools failed to attract interest among the public. He also noted four contributing factors to this failure:

a. negative perceptions of technical works among the public,

b. industrial was a new area and unfavourable field of work,

c. parents valued academic achievements over technical skills,

d. the public doubted the quality of education in technical schools.

Adapted from Emat's (p.2-3, 1993) work.

The development of technical schools was found to be stagnant during Japanese occupation. Emat (1993) noted that there was no record of new technical schools or development during this period. After the World War 2, during 1957 to 1960, eight more Trades Schools (Sekolah Ketukangan) were introduced in the rural areas and were introduced as Secondary Schools for villagers. Under the Razak Report 1956, these technical schools were aimed to:

a. provide skilful workers for the industries,
b. realize parents' demands to provide technical training for their children,
c. realize the aspirations of Razak Report 1956 and Rahman Talib Report 1960, especially in introducing Comprehensive Education System for Malaysian.

Adapted from Emat's (p.2-3, 1993) work.

After independence, TVET has been addressed enormously in the First Malaysian Plan (Rasul et al., 2015). Evidently, Emat (1993) noted that 19 Secondary Schools for villagers were introduced and known as National Secondary School. He further mentioned that these schools accepted enrolment of Level 7 to 9 students. These students were introduced to pre-vocational education and training, specifically in Agriculture Science, Commerce or Home Economics (for girls) and Industrial Art (for boys). After that, the students were subject to sit for Lower Certificate Education (SRP).

The golden era for TVET in Malaysia started from 1960. For instance, starting 1968, after sitting for Lower Certificate Education (SRP), students were given an opportunity to either continue in Technical Schools or Vocational Schools. In addition, by 1968, Emat (1993) noted that a number of Technical Schools, Polytechnics and universities that offered technical training, were introduced across Malaysia.

Four years later, during 1972 to 1973, six more Vocational Secondary Schools and a number of Technical Secondary Schools were introduced with the funding from World Bank (Emat, 1993). By 1988, Emat (1993) stated that an overall of nine Technical Secondary Schools, 46 Vocational Secondary Schools and five Polytechnics in Ipoh, Kuantan, Batu Pahat, Alor Star and Kota Bharu were introduced. Ever since, the number of technical and vocational education training institutions has increased to cater to the increasing number of students enrolled in these institutions.

Up until 1986, the enrolment to Technical and Vocational Secondary Schools was too high. Therefore, the Ministry of Education Malaysia has reformed the TVET education. Emat (1993) noted that the reform, which is known as the New Vocational Education System was introduced in all Vocational Secondary Schools across Malaysia. The students were selected based on their Lower Certificate Education (LCE) result. The Vocational Secondary Schools emphasized both academic and vocational subjects. Also, the new Malaysian Certificate of Vocational Education (Sijil Pelajaran Vokasional Malaysia, SPVM) was introduced in the Form 5. Students who achieved excellent results in this examination were offered to further in Form 6, Teacher Training Institute, Mara Technology Institute or Polytechnics.

On the other hand, Emat (1993) stated that for the vocational training students, they were trained to be competent in a cluster of working skills. They were subject to sit for an examination under the National Vocational Training Council (Peperiksaan

Majlis Latihan Vokasional Kebangsaan, MLVK) and will be awarded with basic skills certification (Rasul et al., 2015).

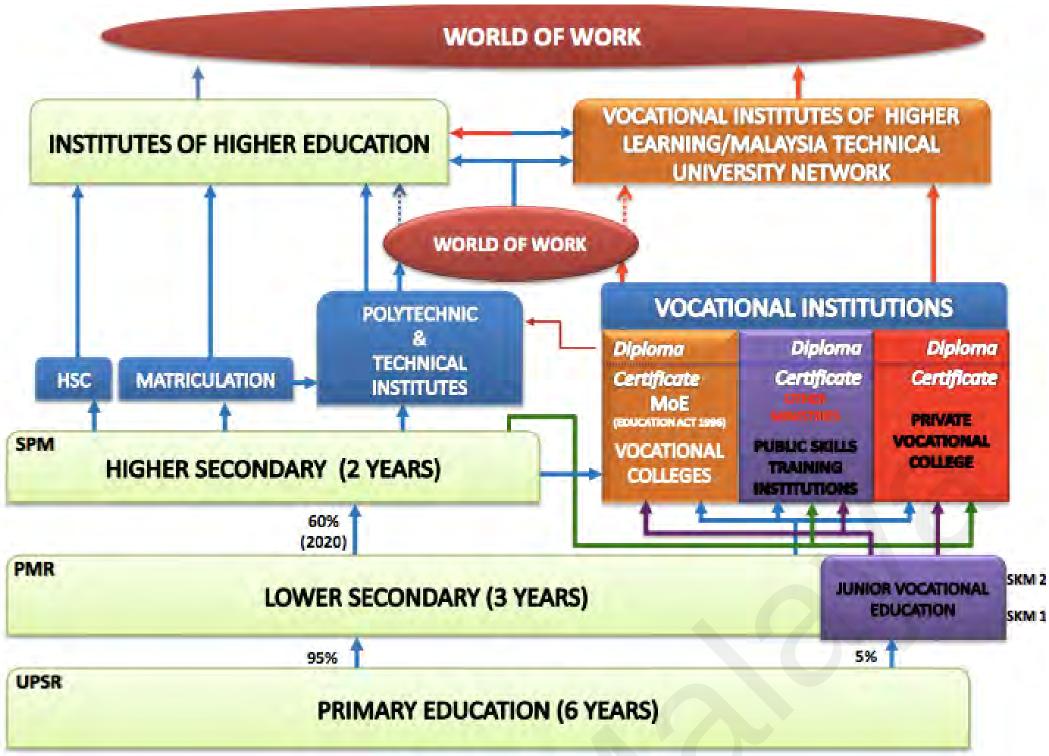
In the 1990s, Malaysian TVET has achieved a global networking. According to Rasul et al. (2015), the introduction to new production process and technology has resulted in the development of educational networking agencies between Malaysia, Germany and France. The German Malaysia Institute (GMI) and Malaysia France Institute (MFI) were established to realize current needs of the industry. In addition, Rasul et al. (2015) noted that TVET institutions in Malaysia have been reviewed and upgraded. As the result, 69 secondary vocational schools were upgraded to technical schools in 1995. Other institutions, such as polytechnics, Community Colleges, MARA Vocational Institutes and Industrial Training Institutes were also upgraded and renewed (Rasul et al., 2015).

In short, the development of TVET in Malaysia has constantly considered its quality and contribution to the society. Over the years, we have witnessed that TVET institutions in Malaysia expanded with numerous reformations made in the curriculum and its infrastructure. Generally, it is hoped that the development of TVET institutions in Malaysia will achieve the aspiration of Malaysian technical education, which aims to provide adequate technical training (in knowledge, skills, understanding and work-related competencies), advance the industrial sectors, and to equip students' learning development and future employment (Emat, 1993; Rasul et al., 2015). Conclusively, the development of TVET in Malaysia agrees with the UNESCO's efforts in enriching TVET quality as the mean to empower educational knowledge, technical and scientific knowledge, and practical skills in preparation for future work field. Since 1906, the development of TVET in Malaysia has not been discouraged even though the public acceptance and view were very discouraging. In 1986, we have learned that Malaysian

TVET has expanded across the country. Also, the teaching and learning in these institutions consider both academics and practical skills development, which is in line with the notion of developing 'Economic and Industrial Understanding' and 'Careers Education and Guidance', as proposed by Wellington (1993). It has been witnessed that Malaysian TVET considers the different learning phase of the students, as different alternatives were available for students who achieved excellently or for those who were struggling. In short, the development of Malaysian TVET is significantly relevant to the needs of the society and global trends at large.

The Landscape of TVET Colleges in Malaysia.

In Malaysia, TVET has been introduced from as early as lower secondary level. Students who are interested to pursue in Junior Vocational College are given vast opportunities to choose vocational institutions from Vocational Colleges, Public Skills Training Institutions or Private Vocational Colleges. These institutions offer Diploma Certificate by the end of the study (MOEM, 2012). On the other hand, the higher secondary students are given more opportunities to further in TVET institutions. They can either further their study in Polytechnic and Technical Institutes or in aforementioned Vocational Institutions. Both channels offer opportunities to further in advanced diploma level and later in higher learning institutions (MOEM, 2012). Figure 2.25 below represents the education pathway in Malaysia.



Source: MOEM (2012).

Figure 2.25 Education pathway in Malaysia.

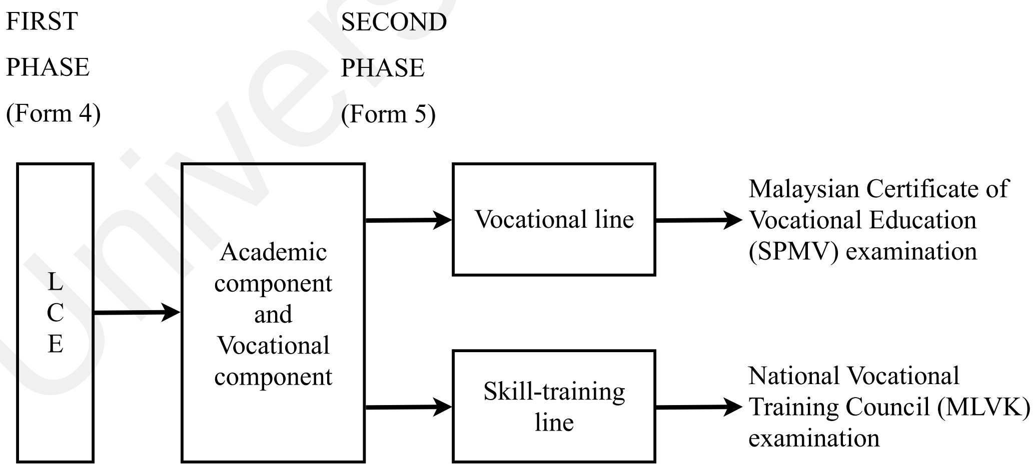
In delivering TVET in Malaysia, multiple agencies are working hand in hand, under the Malaysia Qualification Agency (MQA), which functions as an agent to harmonize the TVET provision. According to MOEM (2012), the Malaysian Skills Certification (Level 1 and 2) training is offered by 548 Private Accredited Centre, 14 IKBN institutes (Institut Kemahiran Bina Negara, IKBN), 209 GiatMARA institutes, 79 Vocational Colleges, 56 Community Colleges, and other relevant institutes. On the other note, Technology Certificate (Sijil Teknologi) is offered by 22 ILPs (Institut Latihan Perindustrian, ILP), 14 IKBN institutes, 209 GiatMARA institutes, 12 IKMs (Institut Kemahiran MARA), and 79 Vocational Colleges, across Malaysia. For Diploma level, a number of training institutes, such as Vocational College, GMI, IKTBN (Institut Kemahiran Tinggi Belia Negara) and Private Accredited Centre is offering this course. Clearly, the role of Vocational Colleges is very dominant in TVET development, as it offers three levels of certifications in TVET.

As outlined by MOEM (2012), an analysis for Blue Ocean Strategy in 2009 highlights the weaknesses of the current practice of TVET, where irrelevant courses/subjects, quality of teaching/curriculum, and entrepreneurship training are among hindrances to quality TVET outcomes (MOEM, 2012). In providing alternative to the poor quality in these three areas, the Blue Ocean Strategy initiatives have been implemented. The efforts include improving the quality of instructors, introduction of traineeship and apprentice programmes, and enhancement of school enterprise activities. Theoretically, these efforts reflect the industry-based curriculum as outlined by Wellington (1993). Two major areas, entrepreneurship and industrial understanding are given an ample emphasis in the new TVET curriculum.

In realizing the aspirations to reduce skill gap and produce skilled labours for the future, the need for TVET transformation has been addressed in the Malaysia Education Blueprint 2013-2025 (MOEM, 2012). In ensuring students' employability, six key areas are addressed, which include soft skills, English proficiency, vocational skills, vocational theory, entrepreneurial, and industry experience. MOEM (2012) also noted that these skills were failed to achieve in the previous curriculum settings. Hence, it is significant to review and change the teaching and training practices in TVET institutions, especially Vocational Colleges.

The Teaching and Learning of Vocational Colleges in Malaysia.

Starting 1990s, the curriculum of Malaysian TVET has been reviewed and numerous changes were made to improve the quality of delivery and outcomes. In the work of Emat (1993), he deliberately discussed the structure of the 'new' vocational education curriculum. In the previous section, it has been presented the structure of TVET during the 1990s. After the Lower Certificate Examination, students in vocational secondary schools were introduced with the ‘new’ TVET curriculum. This curriculum focussed on developing academic and vocational components. Students’ performances were thoroughly evaluated based on their works in both components. According to Emat (1993), by the end of Form 4, the excellent students were given an opportunity to continue in vocational education line. Whereas, students who achieved ‘B’, ‘C’ or ‘D’ grade, were advised to continue in skill-training line. Therefore, there were two different national examinations for both groups. According to Rasul et al. (2015), the first group was subject to sit for Malaysian Certificate of Vocational Education (Sijil Pelajaran Vokasional Malaysia, SPVM) and the second group was required to sit for National Vocational Training Council examination (Peperiksaan Majlis Latihan Vokasional Kebangsaan, MLVK). Figure 2.26 below summarizes the structure of vocational secondary school in the 1990s.



Source: Emat (p.22, 1993).

Figure 2.26 The structure of vocational secondary school in the 1990s.

On the other hand, the structure of teaching and learning for both groups were different. For the vocational line students, they have to learn 10 subjects throughout the course. In contrast, students in skill-training line only took five subjects. The structure of teaching and learning subjects is presented in the table below (Table 2.7 and 2.8).

Table 2.7 *The subjects and contact hour for vocational line*.

No.	Subject	Contact hour per week
1	Malay Language	5
2	English Language	4
3	Mathematics	5
4	Science	4
5	Geography	3
6	Islamic Studies/Religious Studies	3
7	Modern Studies	2
8	Engineering Technology	4
9	Skills Training	13
10	Technical Drawings	4
	Total	**48**

Table 2.8 *The subjects and contact hour for skill-training line.*

No.	Subject	Contact hour per week
1	Malay Language	3
2	Islamic Studies/Religious Studies	3
3	Vocational Theories	4
4	Vocational Training	33
5	Technical Drawings	3
	Total	**46**

Source: Emat (p.23, 1993).

In the vocational line, the academic components are majorly emphasized in the teaching and learning. Students are required to take seven academic component subjects and only three technical subjects (Engineering Technology, Skills Training and Technical Drawing). Whereas, in skill-training line, only two academic component subjects and three vocational component subjects are being introduced (Vocational Theories, Vocational Training, Technical Drawing).

However, under the recent Vocational Education Transformation (also known as *Transformasi Pendidikan Vokasional,* TPV), the focus of Malaysian Vocational Colleges is focusing is to develop skilled labour and entrepreneur in high-impact sectors (Technical and Vocational Education Division, 2015). This is because the public acceptance of vocational education is still low. According to Technical and Vocational Education Division (2015), only 4% of overall Malaysian students are enrolled in vocational education line, compared to other neighboring countries such as Indonesia with 53% enrolment rate, Thailand with 45% enrolment rate, Korea with 25% enrolment rate, and Singapore with 25% enrolment rate.

Hence, under the transformation plan, 80 Vocational Colleges have been developed across Malaysia, that offer 33 different courses. Table 2.9 represents the list of Vocational Colleges across Malaysia and Table 2.10 represents the courses offered across these 80 colleges.

Table 2.9

Malaysian Vocational Colleges

State	Vocational College	
Perlis	1.	Arau Vocational College
(two colleges)	2.	Kangar Vocational College
Kedah	1.	Kulim Vocational College
(five colleges)	2.	Langkawi Vocational College
	3.	Alor Star Vocational College
	4.	Sungai Petani (1) Vocational College
	5.	Sungai Petani (2) Vocational College
Pulau Pinang	1.	Nibong Tebal Vocational College
(five colleges)	2.	Butterworth Vocational College
	3.	Batu Lanchang Vocational College
	4.	Balik Pulau Vocational College
	5.	Seberang Prai Vocational College
Perak	1.	Gerik Vocational College
(ten colleges)	2.	Ipoh Vocational College
	3.	Seri Manjung Vocational College
	4.	Seri Iskandar Vocational College
	5.	Slim River Vocational College
	6.	Taiping Vocational College
	7.	Kuala Kangsar Vocational College
	8.	Leboh Cator Vocational College

	9.	Kerian Vocational College
	10.	Teluk Intan Vocational College (Agriculture)
Selangor (eight colleges)	1.	Sungai Buloh Vocational College
	2.	Shah Alam Vocational College
	3.	Klang Vocational College
	4.	Kajang Vocational College
	5.	Kuala Selangor Vocational College
	6.	Gombak Vocational College
	7.	Sepang Vocational College
	8.	Sultan Abdul Samad Vocational College
Kuala Lumpur (two colleges)	1.	Setapak Vocational College
	2.	Setapak Vocational College (ERT/Home Economics)
Melaka (three colleges)	1.	Melaka Tengah Vocational College
	2.	Datuk Seri Mohd Zin Vocational College
	3.	Datuk Seri Abu Zahar Isnin Vocational College
Negeri Sembilan (six colleges)	1.	Port Dickson Vocational College
	2.	Ampangan Vocational College
	3.	Kuala Klawang Vocational College
	4.	Juasseh Vocational College
	5.	Dato' Lela Maharaja Vocational College
	6.	Dato' Undang Haji Muhamad Sharip Vocational College
Johor (eight colleges)	1.	Batu Pahat Vocational College
	2.	Segamat Vocational College
	3.	Kota Tinggi Vocational College
	4.	Muar Vocational College
	5.	Kluang Vocational College
	6.	Tanjung Puteri Vocational College
	7.	Johor Bahru Vocational College (Business)
	8.	Azizah Vocational College (ERT/Home Economics)
Pahang (eight colleges)	1.	Puteri Vocational College (ERT/Home Economics)
	2.	Tengku Ampuan Afzan Vocational College
	3.	Sultan Ahmad Shah Vocational College
	4.	Sultan Haji Ahmad Shah Al Mustain Billah Vocational College
	5.	Muadzam Shah Vocational College
	6.	Temerloh Vocational College
	7.	Kuantan Vocational College
	8.	Chenor Vocational College (Agriculture)
Kelantan (five colleges)	1.	Kuala Krai Vocational College
	2.	Pengkalan Chepa Vocational College
	3.	Pasir Mas Vocational College
	4.	Tanah Merah Vocational College
	5.	Bachok Vocational College

Terengganu (four colleges)	1.	Kuala Terengganu (Wakaf Tembesu) Vocational College
	2.	Kemaman Vocational College
	3.	Besut Vocational College
	4.	Dungun Vocational College
Sabah (eight colleges)	1.	Kudat Vocational College
	2.	Keningau Vocational College
	3.	Labuan Vocational College
	4.	Sandakan Vocational College
	5.	Lahad Datu Vocational College
	6.	Tawau Vocational College
	7.	Likas Vocational College
	8.	Beaufort Vocational College
Sarawak (six colleges)	1.	Kuching Vocational College
	2.	Matang Vocational College
	3.	Betong Vocational College
	4.	Sibu Vocational College
	5.	Bintulu Vocational College
	6.	Miri Vocational College

Table 2.10

Courses offered in Malaysian Vocational Colleges

Field	**Course**	
Engineering Technology: Electric and Electronics	1.	Electrical Technology
	2.	Electronic Technology
	3.	Mechatronic Technology
	4.	Telecommunication Technology
Mechanical Engineering and Manufacturing Technology	1.	Industrial Machinery Technology
	2.	Welding Technology
	3.	Automotive Technology
	4.	Refrigeration and Air Conditioning Technology
Civil Engineering Technology	1.	Building Construction Technology
	2.	Wood Manufacturing and Furnishing Technology
	3.	Building Maintenance and Service Technology
Marine Engineering Technology	1.	Marine Engine Technology
	2.	Boat Making technology
Transportation	1.	Train Maintenance Technology
	2.	Air-Craft Maintenance
Art and Culture	1.	Stage Management Technology
	2.	Event Management

Hospitality and Tourism	1.	Culinary Art
	2.	Bakery and Pastry
	3.	Tourism
Craft Industry	1.	Batik Craft
	2.	Metal and Gold Craft
Care and Community Services	1.	Fashion and Dressmaking
	2.	Cosmetology
	3.	Child Care
Business	1.	Business Management
	2.	Administration Secretaryship
	3.	Banking
	4.	Insurance
	5.	Marketing
	6.	Retail Management
	7.	Accountancy
Information and Communication Technology	1.	Computer System and Network Technology
	2.	Creative Media (Animation)
	3.	Graphic Design
	4.	Print Media Industry
	5.	Database System Management
	6.	Web Application
Sport Industry	1.	Equine Management
Agriculture	1.	Crop-Food Agroindustry
	2.	Ruminant Livestock Agroindustry
	3.	Poultry Livestock Agroindustry
	4.	Agro Mechanization
	5.	Herbs
	6.	Biotechnology
	7.	Aquaculture
	8.	Ornamental Horticulture
	9.	Landscape
	10.	Agro-based Processing
	11.	Floriculture

Even though, 33 courses are being offered in Malaysian Vocational Colleges, there are a number of courses that has no enrolment until 2015, which are; a) Marine Engineering Technology, b) Transportation, c) Arts and Culture, d) Crafts, and e) Sport Industry (Technical and Vocational Education Division, 2015). In addition, the course with most enrolment is Mechanical Engineering and Manufacturing

Technology with a total of 16788 students and is followed by Engineering Technology: Electric and Electronics, with a total of 10403 students, and Business with a total of 7557 students, until 2015 (Technical and Vocational Education Division, 2015). Other courses have a total of 4044 students for Civil Engineering Technology, 3070 students for Hospitality and Tourism, 3059 students for Care and Community Services, 2177 students for Information and Communication Technology, and 2481 students for Agriculture (Technical and Vocational Education Division, 2015).

Interestingly, the offered courses in Malaysian Vocational Colleges are in parallel to the demanding sectors or our local industry. According to the Departments of Skills Development (2016), the National Occupational Skill Standard (NOSS) document outlines the career path (with specific occupational areas) and expected competencies for each job. In this document, there are 29 sectors that reflect the local industry. Based on the courses offered, it is apparent that these courses are the potential career path for students after they graduated from the college. In order to develop students' vocational and technical skills, the instructors in these vocational colleges have received certification under the Malaysian Skills Certification System. Based on the data from Technical and Vocational Education Division (2015), a majority of instructors (2485 instructors) have Level 3 certification. This is followed by 264 instructors with Level 2 certification, 264 instructors with Level 1 certification, 39 instructors with Level 4 certification, and 11 instructors with Level 5 certification. Yunos, Ahmad, Kaprawi and Razally (2006) noted that the certification framework highlights the relevant competencies needed by the industry. Therefore, it is very pivotal for instructors to awarded with Malaysian Skills Certification, so that they are exposed to types of competencies required for each sector before they start to teach the students in vocational colleges.

On the other hand, under the current TVET curriculum practice, the ratio between academic component and vocational component has been reviewed and changed. As stated in the Malaysian Education Blueprint 2013-2025, MOEM (2012) stated that the ratio has been changed to 70% practical skills and 30% academic learning. As discussed earlier, the challenges in previous TVET curriculum were its inefficiency in producing skilled labours and poor quality in empowering soft skills, English proficiency, vocational skills, vocational theory, entrepreneurial, and industry experience. Clearly, the previous curriculum was insignificant to the current demands of human resource. Tabbron and Yang (1997) highlights the importance of constantly evaluating the relationship between education agencies and policies with the current demands of human resources. Similar concern was addressed in African countries, as Odora and Naong (2014) stated that the current TVET practice is less effective to equip students with relevant core skills to meet the needs of market demands.

It needs to be clarified that root of this problem is in curriculum inefficiency to consider the complex process of designing the content and context of teaching and learning (Kolstenik et al., 2014) with the needs of learners and education aspirations (Copple & Bredekamp, 2009). The failure in TVET curriculum in realizing its education aspirations is not a rare case. Even in advanced countries, the similar case has been addressed. The rapid changes of the human resources and advancement in technology have created doubts and uncertainties among curriculum developer on the important content and highlights in designing a sound TVET curriculum (Tabbron & Yang, 1997). However, in the localized context of Malaysia, there are studies that tried to reshape the direction of TVET curriculum in order to sustain its quality and relevancy to the current needs of the society. Previously, it has been presented the sustainable framework for TVET in Malaysia, as proposed by Minghat and Yasin (2010). Through Delphi technique, the experts agreed that ample emphasis should be given on ensuring administration efficiency (networking and partnership, staff development programme, counseling, interests, articulation, and commitment of management), content and context of learning (creativity, innovation, generic skills, industrial relations and internship, entrepreneurship, ICT skills, knowledge, interests, competency based training) and instructors' mastery (teaching methods, recognition, interests, competency based training, articulation, and commitment of management). These elements are the guiding foundation to review TVET curriculum in sustaining its quality for future. The Blue Ocean strategy plan (2009), as presented by MOEM (2012) have touched on majority of these elements, such as content of courses and subject and its quality, administration management, entrepreneurship programme, partnership with industry, and rebranding to create new image for TVET in Malaysia. However, what seem to be uncertain is the elements of an effective TVET curriculum. As referred to Minghat and Yasin (2010), teaching and learning should consider the development of creativity, innovation, generic skills, industrial relations and internship, entrepreneurship, ICT skills, knowledge, interests, competency based training. With the current and revised curriculum, certain areas have been addressed. MOEM (2012) mentioned that the areas such as industrial relations and internship, entrepreneurship, knowledge and competency based training are majorly emphasized, with the bigger ration (70%) of learning is on the knowledge practicality.

In learning from the inefficiency of TVET curriculum in the past and in different context across the globe, the revamp in TVET curriculum has been made in advanced countries, such as in Germany, United Kingdom, and United States

(Mourshed et al., 2014; Tabbron & Yang, 1997) but the outcomes were discouraging. With constantly changing demands in human resource, Tabbron and Yang (1997) agreed with Sako's (1994) statement that the employers are looking for excellent communication skills, positive working attitudes (which includes working as an individual and in a team), strong understanding of work-related knowledge, and relevant vocational and technical skills. Specifically, these skills are related to technical communication development. For instance, Wellington (1993) summarizes technical communication as the skills that embody interpersonal skills (working in teams, teaching others, serving customers, leading, negotiating, and working well with people form different cultural backgrounds) in working field. McMurrey (2002) expanded this definition by including abilities to communicate technical information, conveying information with accurate purpose for specific audience in the technical field, and presenting ideas by using relevant communication tools effectively. Relevant to the Malaysian context, MOEM (2012) stated that English proficiency and soft skills are among relevant skills emphasized in the new vocational curriculum. However, what remains doubtful is the content of English subject, which falls in the academic component, in preparing vocational students with a strong foundation of technical communication.

Previously, the specific elements (McMurrey, 2002; Mitchell, 1962; Reaves, 2004; Rus, 2014), types of technical communication (McMurrey, 2002; Mitchell, 1962) and methods of delivery (Rus, 2014) have been deliberately discussed. English subject in the current Malaysian Vocational Colleges is viewed as an academic component. However, the emphasis of developing soft skills and English proficiency is expected to equip vocational students with work-school related competencies and skills. One major consideration is to ensure the content of teaching and learning of

English subject is transferable to practical component. Similar concern has been addressed by Tabbron and Yang (1997), where they mentioned that communication competency should cover multiple disciplines in the work field. The demands of current human resources have also placed specific technical communication to be significantly important to the work field (McMurrey, 2002; Mitchell, 1962; Reaves, 2004; Rus, 2014). Therefore, it remains doubtful how the current English language subject in Malaysian vocational college is relevant to develop this skill.

The English Language Subjects in Malaysian Vocational Colleges (General English, English for Specific Purposes, and English for Communication) to Develop Communication Skills.

In the academic module for Malaysian Vocational Colleges, English Language is one of the core subjects that is being introduced to all students of throughout their learning of Certificate Level (or Malaysian Skills Certification Level 1 to 3) and in Semester 4 of Diploma Level (Malaysian Skills Certification Level 4). The English Language subject comprises of three different modules according to students' certification levels. General English is being introduced to Certificate Level students in Semester 1 and 2, whereas English for Specific Purposes is the continuation for them when they reach Semester 3 and 4. On the other hand, English for Communication is only introduced for students of Diploma Level when they reach Semester 4.

Generally, in the new English Language Standard Curriculum Document for Malaysian Vocational Colleges, Ministry of Education Malaysia (MOEM) (2014a) has highlighted four important outcomes of two subjects at Certificate Level. These outcomes cover basic communication skills, such as the skills to form and maintain a conversation for obtaining goods and services, to retrieve and use information for communicative purposes, to express personal thoughts and feelings in both oral and written form, and to generally develop moral values among students. These skills are the general communication skills that are aimed to help students to communicate effectively in a group or organization. According to MOEM (2014) the underpinning principle of General English is derived from English for Specific Purposes, which in turn will help to prepare students to learn English for Specific Purposes (Semester 3 and 4). In order to achieve this, MOEM (2014a; 2014b) has outlined the direction of teaching for this subject. Generally, there are eight major skills to be taught in Malaysian Vocational Colleges throughout the Certificate Level, which are: a) dictionary skills, b) conversation skills, c) social skills, d) communicative skills, e) reading skills, f) writing skills, g) integrated skills, and h) oral communication skills. Also, MOEM (2014a; 2014b) noted that the summative assessment or known as "course assignment" is used as a platform to introduce students to authentic communicative experiences outside classroom settings and to assess their communicative skills.

Very interestingly, MOEM (2014a) has outlined the direction of teaching and learning of this subject throughout the four semesters duration. Based on the Table 2.11 below, in Semester 1 and 2, six skills are being introduced; conservational skills, social skills, communicative skills, reading skills, integrated skills, and writing skills. For conversational skills, the focus in Semester 1 is only to develop basic conversational skills, such as introducing one self and to converse with friends to establish friendships. In Semester 2, the conversational skills are more focusing on talking about personal experiences with friends and exchanging opinions and ideas.

Table 2.11

The communication skills introduced in Semester 1 and 2 in General English subject.

Skill	Semester 1	Semester 2
Conversational Skills	Make friends and keep friendships.	Talk about experiences and exchange ideas.
Social Skills	Take part in social interaction.	Take part in a variety of social interaction
Communicative Skills	Obtain goods and services.	Plan and make arrangements for social engagements.
Reading Skills	Obtain information for a variety of purposes.	Obtain and present information from various sources.
Integrated Skills	Process information.	NA
Writing Skills	Present information to different audiences.	Present information creatively to a specific audience.

In the social skills cluster for Semester 1, the students will be exposed to social skills, where they are encouraged to participate in social interaction, such as in discussing plans for social activities with their friends. According to MOEM (2014a), the focus is to expose students to new vocabulary through communicative activities. Similarly, in Semester 2, the focus is to develop this skill and new vocabulary, as well as to encourage students to ask and reposed to questions, and solve problems related to organizing a social activity. These skills are also the prerequisite for communicative skills in both semesters. MOEM (2014a) noted that in communicative skills, students will be introduced to communicative practices in obtaining information about goods, placing orders and launch complaints in written and oral form. Whereas in reading skills, in both semesters, the focus is first to introduce students to basic skills of reading, which includes skimming, extracting information and sequencing the ideas. These skills will be further developed and used in developing students' interpretations of linear and non-linear texts, and organization of ideas based on the text read.

On the other hand, integrated skills are only being introduced in Semester 1. The main focus of developing integrated skills is to develop students' information processing skills. MOEM (2014a) stated that among the skills in this topic are the ability to sequence the ideas, make conclusion based on the ideas, interpret them accurately, and produce short notes and mind maps. Lastly, for writing skills, the introduction of basic writing skills, such as presenting ideas in the form of written notes, summarizing information, and producing written products with appropriate formats that are clear to readers. According to MOEM (2014a), these skills serve as a foundation for students' writing competency, because in the second semester, students are expected to be able to creatively present information to specific audience.

Table 2.12

The communication skills introduced in Semester 3 and 4 in English for Specific Purposes subject.

Skill	**Semester 3**	**Semester 4**
Dictionary Skills	Acquire dictionary skills tofacilitate understanding.	Acquire, understand and increase specific vocabulary to facilitate better understanding.
Gather Information Skills	Gather information to carry out their course assignments.	Use a variety of information gathering skills to carry out course assignments.
Reading Skills	Develop reading skills.	Use reading skills to comprehend and perform tasks.

Writing Skills	Develop writing skills.	Develop writing skills.
Communication Skills	Enhance general communication skills.	NA
Course Assignments	NA	Complete course assignments.

In the third and fourth semester, MOEM (2014b) highlighted that the primary outcomes of this subject are to: a) equip students with dictionary skills, b) improve students' information-gathering skills, c) enhance students' pronunciations and the use of targeted vocabulary for communicative purposes, and d) develop students' writing skills.

In the Table 2.12 above, it is apparent that the teaching and learning process of English for Specific Purposes has been extended in order to develop all four language skills (listening, speaking, reading and writing). Clearly, the skills in Semester 4 are the extension of the outcomes of learning from Semester 3. For instance, for dictionary skills, in Semester 4, students are expected to be able to not only acquire the new vocabulary but also to be competent in using common abbreviations found in the technical manuals or handbooks. Other than that, in gathering information skills, MOEM (2014b) noted that the focus of learning in Semester 3 and 4 is to strengthen information gathering skills, skimming and scanning for important information from the text, and using the information to complete course assignments. Similarly, for both reading and writing skills, the focused skills from Semester 1 and 2 will be further developed in these two semesters. For instance, in reading skills, the skills are not only restricted to read and locate the main ideas and supporting details, but also include the ability to summarize the findings and content of the reading, which will further be used in activities for writing skills. In addition, the writing skills require the information-gathering skills and reading skills across all semesters in order to produce texts or documents in different formats. Also, MOEM (2014b) noted that accuracy of language is one of the major focus in writing skills. Hence, students are expected to use accurate vocabulary and language structures in producing the texts. Lastly, the course assignments are the summative assessments for this course. In Semester 4, all languages skills, such as the use of communication skills, information-gathering skills, reading and writing skills will be evaluated through various assessment tasks. MOEM (2014b) noted that continuous assessment is still being implemented in all semesters, but for Semester 4, the assessments evaluate the overall language skills through more authentic experiences such as in the field works, and apprenticeships. It is hoped that through the exposure of real-working environment, students would be able to practice what they have learnt throughout four semesters in a real-working field.

On the other hand, for Diploma Level, English for Communication subject is introduced in the Forth Semester (two hours per week) and is aimed to further: a) develop students' listening strategy, b) provide authentic opportunities for students to interact, c) develop students' ability in sharing and expressing ideas orally, d) develop oral presentation skills, and, e) develop problem-solving skills. Table 2.13 summarizes the skills emphasized in this subject.

Table 2.13

The communication skills introduced in English for Communication subject.

Skills	**Subskills**
Oral Communication Skills in the Workplace	Focus on the use of accurate language to: Communicate with/report to superior Communicate with colleagues Instruct subordinates Communicate/ deal with customers/suppliers
Oral Presentation Skills	Focus on how to: Identify purpose of communication, research and develop content of communication

	Present effectively to audience in different settings Apply non-verbal communication in presentation Apply visual aids/technology to support presentation
Problem Solving and Decision-Making Skills	Focus on how to: Differentiate problems, challenges and situations that require an action Identify problems in real working settings Apply suitable problem-solving techniques

Based on Table 2.13, three major skills are being introduced: a) oral communication in the work place, b) oral presentation, and c) problem solving and decision making. In developing oral communication skills in the work place, MOEM (2014c) stated that students are expected to be able to communicate effectively; in giving instructions, reporting to authorities, and deal with customers, suppliers and co-workers. Students' communicative practices in the classroom should use authentic examples of the industry. In order to assess these skills, MOEM (2014c) stated that there are four performance criteria that should be mastered, which are: a) how they use language for interpersonal purposes, b) to the use of accurate language, intonation and stresses, c) how to politely respond to questions and share information, and d) how to effectively share information or experiences related to work.

On the other hand, in developing oral presentation skills, MOEM (2014c) stated that students are expected to identify and research on a topic of presentation, and to present effectively with the appropriate non-verbal gestures and visual aids. This is similar to the concept of developing oral technical communication skills as the use of effective presentation strategy; identifying the purpose of presentation, researching on relevant information, and integrate the use of visual aids to enhance oral presentation (Cook, 2002; Reaves, 2004; Lappalainen, 2010). MOEM (2014c) further outlined the relevant performance criteria to help assess students' mastery of oral presentation skills are through: a) how they select materials or resources to develop content of presentation, b) how they use of verbal and non-verbal cues in delivering presentation, and c) how they use visual aids, such as graphic organizers to help support the presentation. These criteria are believed to be beneficial for teachers in designing the learning experiences and assessment for students.

Lastly, in developing problem-solving and decision-making skills, MOEM (2014c) stated that the focus of teaching and learning should be focusing on helping students to understand and distinguish problem, challenge and situation that requires actions, and identifying and applying appropriate problem-solving strategy to the identified problem, challenge or situation that requires immediate action in a work place. Similarly, technical communication skills emphasize on the importance of understanding a problem and decision-making process in a work place. According to McMurrey (2002), one of the focus of technical communication skills is to develop students' ability to communicate ideas to solve a problem occurs in a work place, and the information need to be relevant and address professional, business and industrial applications. In fact, in the earlier work of Mitchell (1962), he firmly emphasized that the information that is about to be shared with other workers need to be critically researched before being presented to the target audience. This indicates that the information that is aimed to address a problem in a work place must undergo a critical proses researching phase, which is one of the prominent skills in technical communication (Brinkman & van der Geest, 2003; Cook, 2002; Rus, 2014).

In a bigger picture, these three subjects reflect Littlejohn and Foss's (2005) General Communication model and Bale's (1950) Interaction Process Analysis theory. The General Communication model focuses on the importance of communicators and message to communication. Communicator can either functions as a recipient and sender at the same time. A conversation is established when both parties exchange messages. In Bale's (1950) Interaction Process Analysis theory, this process is further elabourated. They further categorized different types of messages used in a conversation, such as positive and mixed actions (to show friendliness, dramatize and agree on points), negative and mixed actions (to show disagreement), questions (to ask for information, opinion and suggestion) and attempted answers (to give suggestion, opinion, and information). In the General English subject, the focus of learning is to develop the foundation of communication. According to MOEM (2014a, 2014b, 2014c), the expected outcomes of this course are to develop students' ability to communicate clearly and accurately, use different forms of communication (verbal and oral) to present ideas and exchange opinions, gather relevant information to the topic of discussion, and develop language skills, especially on the use of new vocabulary for communicative purposes. Clearly, the expected outcomes of this course have a close relation to Bale's (1950) theory. Evidently, in Semester 1 and 2, students will be exposed to conversational skills, which focus on developing relationship, and exchanging ideas and personal experiences with friends. These skills reflect the "positive and mixed actions" of communication, where they communicate to show friendliness and agree on the points explained by the other party. In addition, across all semester, the development of communicative skills helps students to develop skills in obtaining information from other party and to plan arrangements for social events. Similarly, in reading and writing skills, students are trained to integrate information-gathering skills with writing skills, such as in producing texts with appropriate language and document formats to suit the target audience. These skills are related to element of "attempted answers", "questions", "positive and mixed actions" and "negative and mixed actions" in Bale's (1950) Interaction Process theory. This is because, in obtaining information from other party and to plan arrangements for social events, students will give suggestions, opinions and information, argue on the points discussed, and achieve agreement through discussion with other group members. In addition, in completing the writing tasks, similar communication elements will be used in completing the tasks. In short, the expected learning outcomes for this course is closely derived to reflect the general communication process as outlined by Littlejohn and Foss (2005) and specifically, Bale's (1950) Interaction Process theory. The skills presented in Semester 1 and 2 are the building blocks for consecutive semesters (Semester 3 and 4) in order to help students, acquire a strong foundation of general communication skills. As stated by MOEM (2014) the course is designed not only to prepare them for the work field but also to develop strong social skills for their everyday life as a member of a community.

The relationship between English Language subjects in Malaysian Vocational Colleges and Technical Communication skills. Motivated by the importance of developing communication skills for work field, the MOEM has introduced the three English Language subject throughout four semesters in Malaysian Vocation colleges (for Corticate Level) and one semester (Semester 4) in Diploma Level. Aligning education outcomes and the National Education Philosophy, the ministry is very committed in realizing the aspiration of producing knowledgeable and competent Malaysians, who are in turn will serve for the betterment of the society and country at large. Hence, the subjects are designed based on specific "…language in context and specific language skills" (MOEM, p.2, 2014a) to enable students to be competent in communicating professional knowledge and conducting working tasks. According to Johns and Dudley-Evans (1991), General English is majorly focusing on developing four language skills: listening, speaking, reading and writing.

Communication is not excluded but is not designed based on specific occupational needs or disciplines.

However, it is undeniable, based on the previous discussion, that the three English Language subjects offer a myriad of language skills that is relevant to communication development. Based on the Figure 2.27 below, the subject consists of eight clusters of communication skills that are prominent for communicating professional knowledge and performing work-related activities (MOEM, 2014a; MOEM 2014b; MOEM, 2014c). Also, with the introduction of course assignments, especially in the fourth semester of Certificate Level and the English for Communication subject (for Diploma Level), students will be given an authentic experience to practice their communication skills through field works and apprenticeship activities.

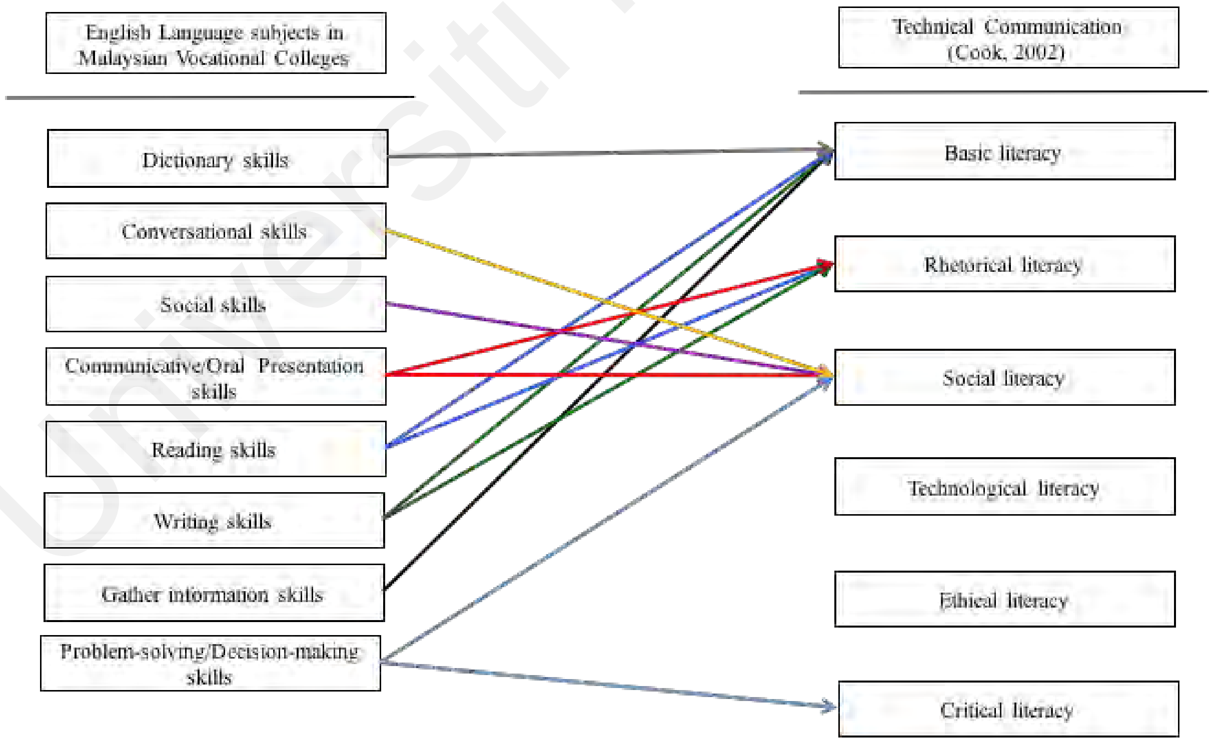


Figure 2.27 The relationship between the General English with technical communication.

However, when viewing these subjects in different lenses, there are a number of weaknesses that worth to be highlighted in this discussion. At this point, it is very apparent that the main purpose of introducing all three English Language subjects to Malaysian Vocational Colleges is to develop communication skills for the work field. This concept is similar to general view of technical communication. Rus (2014) highlighted that technical communication is a strategic communication that has defined purposes and context in delivering professional knowledge and completing work-related tasks to a specific work setting. This definition has been supported by other researchers (such as Brinkman and van der Geest (2003), Cook (2002) and McMurrey (2002)) as they agreed that interpersonal skills, researching skills, technical writing, and oral technical communication skills are very prominent to equipping students for communication in an authentic working setting.

Even though the main purpose of these subjects appears to be almost identical to technical communication, the content or focus of learning is slightly different. In describing the differences, it is relevant to compare these three English language subjects to Cook's (2003) description of technical communication skills. Cook (2002) highlighted that there are six literacies that are prominent for working field: a) basic literacy, b) rhetorical literacy, c) social literacy, d) technological literacy, e) ethical literacy, and f) critical literacy. Based on the above figure (Figure 2.27), all six skills only reflect three literacies in Cook's (2003) technical communication model. According to Cook (2002), basic literacy refers to reading and writing skills that are embedded in technical communication skills. This includes the skills of gathering information, understanding of the texts, and producing work-related texts. Clearly, in the General English and English for Specific Purposes subject, dictionary, reading, writing, and gathering information skills reflect this literacy. However, in a greater analysis of skills in basic literacy, there are some important skills that are not being developed in this subject. Cook (2002) stated that the importance of engaging target audience and responding critically to their needs with the use of effective writing skills are very prominent in the working field. Considering what has been introduced in General English and English for Specific Purposes, MOEM (2014a, 2014b) noted that the aims of developing dictionary, reading, writing and gathering information skills are to learn new vocabulary (dictionary skills), extract important information from texts (reading skills), produce comprehensive texts with accurate usage of English (writing skills), and search and compile information for various sources (information gathering skills). Therefore, it is relevant to state that the focus of learning is based on the general concept of developing language skills. Chiswick and Miller (2014) and Klimova (2014) mentioned that these skills are important to develop basic language skills for communication, however, in preparing students for communication in working field, these skills are inadequate (Reaves, 2004; Rus, 2014).

On the other hand, Cook (2002) defined rhetorical literacy as the ability to critically shape ideas and translate them into a comprehensive and informative documents to suit audience's level of understanding and interests. Cook (2002) stated that among important skills in rhetorical literacy are the understanding of audience and their roles, and analytical skills in understanding information and applying them in commutating them to the target audience. Reflecting this to the current practice in Malaysian Vocational Colleges, communicative, reading and writing skills seem to serve as a foundation to develop rhetorical skills. However, these skills are very limited. Even though MOEM (2014a, 2014b, 2014c) has highlighted the importance of developing communicative skills along with reading and writing skills, the focus of communicative skills in the General English is limited to plan for social activities and to negotiate and discuss about goods and services in both oral and written forms. Also, in the English for Communication subject, the main focus in developing communication for work skills only covers how to instruct subordinates, and communicate with leaders, co-workers and customers. What seems to be loose is the practicality of these skills to working field. Tabbron and Yang (1998) mentioned that in the current industrial settings, transferable skills, which include technical communication skills are very prominent. Possessing a strong foundation of technical communication skills will not only ease communicative purposes with clients but also help to advance an individual performance in an organization. According to Bale's (1960) Interaction Process Analysis theory, different types of communicative competencies are needed to enable an individual to be an effective communicator. Problems such as in communication, evaluation, control, decision, tension reduction, and reintegration requires a strong communication skills, in which a communicator should be able to respond accordingly to a situation. This is what Cook (2002) has considered in describing the literacies in technical communication. As aforementioned, the ability to understand audience, analyse the communicative situations, construct an appropriate content and delivery of communication to the targeted audience are among exclusive characteristics of technical communication.

On the other hand, the current emphases in these English Language subjects concern on developing social literacy. According to Cook (2002), social literacy refers to ability understand working environment, work in teams, and to resolve conflicts that occur at work. Comparing this to focus skills in the General English, the conversational, social and communicative skills are providing opportunities for students to communicate and socialize with their peers. Very encouragingly, the activities are designed around developing students' confidence to communicate and work in teams. MOEM (2014a, 2014b) noted that these skills are useful for students in helping them to communicate professional knowledge and to be able to work in a group with different cultural backgrounds. Therefore, the learning activities focus on developing foundation for students to learn to initiate conversation and establish relationship with audience. Even though in the Diploma course, the English for Communication focuses on developing effective communication with various parties in a working setting, what seems inadequate in this subject is the development of working-in-team skills (such as to give feedbacks or responses, to properly give instructions to achieve work objectives) and conflict handling skills, which are being majorly emphasized in technical communication.

Lastly, the focus of developing problem-solving and decision-making in the English for Communication subject shares some similarities with social and critical literacy of technical communication. MOEM (2014c) stated that in developing these skills, the students should first be able to differentiate between a problem with challenges or situation that requires actions. This is followed by identifying the problem and apply an appropriate problem-solving strategy. In technical communication, Cook (2002) mentioned that these skills are included in critical literacy, where the students are expected to be able to recognize the root problem and take appropriate actions, as well as to produce a piece of writing that address the problem faced by the relevant parties. However, technical communication offers myriad of critical skills such as how to use technology to enhance collabouration, improve knowledge on how to research an issue, and how to handle conflicts in an organization (Cook, 2002; Lappalainen, 2010).

In short, the focus of learning and skills development in all three English Language subjects across Certificate and Diploma Level are inadequate in preparing students for their future work field. Other skills such technological literacy (to use technology to support communication), ethical literacy (understanding of different cultural backgrounds) and critical literacy (critical thinking in producing convincing technical documents and presentations), which are very important to help prepare students for their work field are not being majorly emphasized in the current practice in Malaysian Vocational Colleges. With a pressing issue of poor communication among Malaysian graduates (Awang & Muhamad, 2008; Ismail et al., 2010), there is a need to prepare students with technical communication skills that are closely related to communicative skills in an authentic working experience. It is undeniable that the English Language subjects are aimed to serve as a foundation to equip students with basic language and communication skills. However, with rapid changes in the industry- the needs for more high-skill workers, and the unsuccessful evidences of TVET in producing skilled workers as noted in Mourshed et al's (2014) and Nagendra et al's (2013) study, there is a need to equip students with relevant communication skills for the industry. Therefore, the current practices of this subject in the Malaysian Vocational Colleges should be reviewed and improvised in order to realise its aims to produce skilled workers for the future, who are not only skilful but also able to communicate professional knowledge and conducting tasks effectively in an organization.

Curriculum Development

Providing an effective teaching and learning starts with an organization of structured and sound curriculum. There are a number of considerations that need attention before designing a sound curriculum. Kolstelnik, Rupiper, Soderman and Whiren (2014) established that appropriateness of learning experience should consider the context, ability, interests and experiences of learners. Ross (2000) describes curriculum in two forms; formal and 'hidden' curriculum. Formal curriculum refers to "…what is to be taught in specific institutions…" (p.8). Usually, this is outlined in the National Curriculum and is practiced within the institutions. Other experts agreed that curriculum is formal learning experiences; outlined and proposed as the National Curriculum to guide and standardize the learning across institutions (Finch & Crunkilton, 1999; Siraj, 2008).

On the other hand, 'hidden' curriculum is the teaching and learning that "…is not overtly stated, and which may be unintentionally passed through the process of education." (Ross, p.8, 2000). In addition, the 'hidden' curriculum is sometimes a product of the teaching and learning of the outlined curriculum, and also the product of activities of a culture or society (Ross, 2000). For instance, Kolstenik et al. (2014) describe that curriculum is culturally relevant and should consider meaningful context of learning inside and outside classroom settings.

In achieving an effective development of curriculum, Kolstenik et al. (p.12, 2014) have addressed four key questions to be considered:

a) How to structure the physical learning environment?

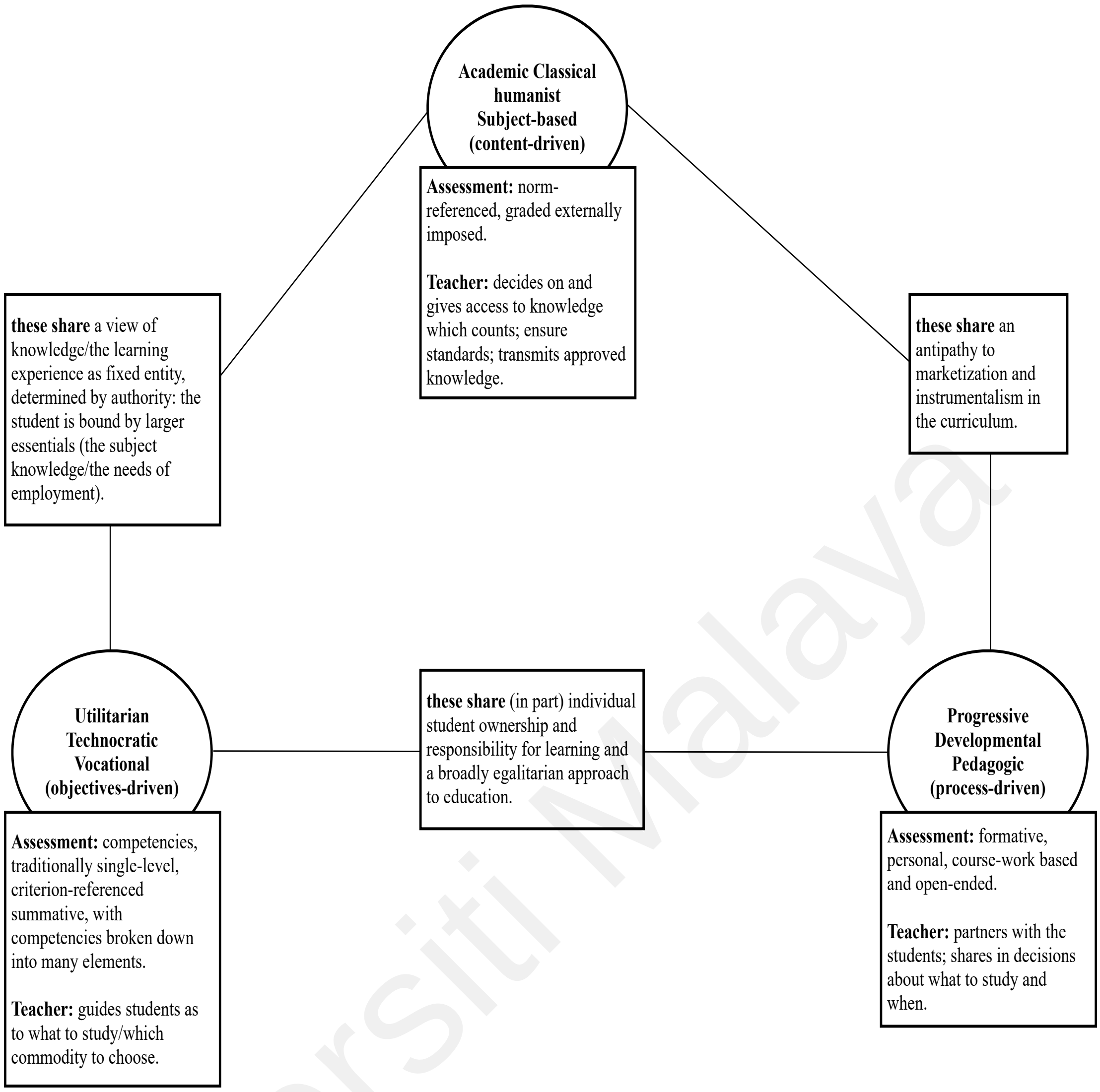
b) How to organize the schedule of the day and daily routine?

c) How to interact with students and individuals surround them?

d) What goals to choose for them?

Within these broad questions, the main element of a curriculum is the production of learning culture. What has been addressed by Kolstenik et al. (2014) is how we develop a foundation for a curriculum, which aims to develop an intended learning culture. A learning culture is a complex process as it constantly evolves to suit the needs of learners and aspirations of education (Copple & Bredekamp, 2009; Kolstenik et al., 2014). Therefore, it is not surprising that the above elements (physical settings, organization, interactions and goals) of curriculum will constantly change to suit the need of the society.

Linking this to the context of TVET institutions, Ross (2000) has explored the curriculum implementation across different institutions in the United Kingdom. In the Figure 2.28 below, there are three prominent curricular models in this country. Previously, it has been established that the structure of learning environment, learning routine, interaction patterns and learning goals are the important elements to be considered in curriculum development. Clearly, across three curricular models, they are similarities and differences in its practice.



Source: Bates, Bloomer, Hodkinson and Yeomans (1998, as cited in Ross, p.129,2000).

Figure 2.28 Relationships between three different curricula models.

Ross (2000) has categorized vocational education as an ‘objectives-driven’ curriculum. He further described objectives-driven curriculum as an education mean to address social needs through education. According to Cotgrove (1958), vocational education in United Kingdom has undergone numerous changes since 19th century. In the early stage, the introduction of TVET in this country has received negative responses from the society. Regardless of the needs to develop more skilled workers at that time, the introduction of TVET was seen as unnecessary and ineffective, compared to general education. One of the major reasons of this failure was poor commitment from the industry (Cotgrove, 1958). However, in later stage, TVET has started to earn its place in the society. The policy makers started to reintroduce TVET to the society and highlighted its importance to the society in future. As the result, more organized curriculum, which was driven from the industry needs, was developed and practical trainings were introduced as part of the curriculum.

Clearly, in the process of securing its ground, an important thing to consider is how to establish relevant curriculum objectives. According to Ross (2000) curriculum objectives "…are specified in advance, and a curriculum is drawn up to achieve these objectives" (p.116). Undeniably, TVET curriculum is represented as objectives-driven curriculum in the literature, specifically as an influential platform to prepare competent workers in dealing with the demands of the human resources of the work field (Burganova, & Veleev, 2015; Oxtoby, 1997; Reaves, 2004; Tabbron & Yang, 1997). In the figure above, Ross (2000) has reviewed Bates et al.'s (1998) comparison of different types of curricula models. In this framework, vocational curriculum is represented as objectives-driven and the role of teacher is to facilitate students' learning. In addition, the assessment of this curriculum, evaluates students' competencies with criterion-based reference. These competencies consist different elements related to technical skills. Similarly, in Engineering schools across United States and Canada, Reave (2004) has mapped that these institutions applied criterion-based assessment in assessing students' competencies. Assessments such as portfolios, presentations and project-based tasks were used to assess students' overall technical competencies throughout the semester.

In a bigger picture, objectives-driven curriculum shares a prominent element with content-driven curriculum: view of knowledge and learning experience as affixed entity. Bates et al. (1998) noted that these two ideologies similarly believe that the knowledge-based subject and competencies for work field direct their learning experiences. Clearly, both ideologies view the importance of knowledge as a foundation in preparing students for their future. However, a major difference between both ideologies is on how they view knowledge that should be acquired by students. The proponents of content-driven curriculum believe that the teachers majorly provide the knowledge. Ross (2000) added that they strongly believe in firm discipline in grading of assessments. This form of curriculum is usually associated with traditional teaching and learning. However, this does not deny its importance and relevancy to vocational education. For instance, Wellington's (1993) description of workplace-school competencies and foundation still place knowledge-based learning as part of the TVET curriculum.

On the other hand, the vocational or objective-driven curriculum also shares some similarities with process-driven curriculum. Both ideologies believe in students' autonomy in learning. Students are responsible on their own learning and are trained to take ownership of their own progress. Previously, it has been mentioned that project-based learning is one of the assessment form used widely in TVET settings (Burganova & Valeev, 2015; Heylen & Sloten, 2013; Reaves, 2004). This kind of assessment allows room for personal ownership of learning.

In short, it has been established that TVET curriculum is objectives-driven curriculum. However, it still shares some characteristics of both subject-based and process-driven curriculum. The technical education has become a prominent education line in realizing the needs of producing skilled workers worldwide. Tremendous efforts were made by numerous agencies, especially by the UNESCO-UNEVOC in expanding the production of skilled workers (UNESCO, 2011). In fact, in 2001, the revised recommendations on technical and vocational education have shaped TVET education to be an integral part of general education, a platform for occupational field training, to promote life-long learning and sustainable development, and generally, to close the gap of poverty across countries (UNESCO, 2011).

The Industry-Based Curriculum.

It has been argued that in the previous section (Chapter 1), there is a need to introduce an industry-based curriculum in TVET as a relevant measure to overcome unemployment and to improve the quality of teaching and learning of TVET institutions (Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997; Tabbron & Yang, 1997). An interesting argument has been enforced by Wellington (1993), in which he argued that the education is failing to meet the needs of the industry. Unemployment is a strong force that is tightly related to education. Wellington (1993) mentioned that the effects of high unemployment might tarnish the image of schools and education as public questioned on their effectiveness. Even discouraging, the education and training in TVET institutions are viewed as incompetent and irrelevant to deal with this problem.

If we trace back what has been presented in the UNESCO-UNEVOC's aspirations in the revised technical and vocational education in 2001, it is clearly stated that the education aims to deal not only with employment but also to enhance general education, lifelong learning and to reduce the gap of poverty across countries (UNESCO, 2011). In fact, in the localized context of Malaysia, the Malaysia Education Blueprint 2013-2025 (Ministry of Education Malaysia, 2012) has mapped the next step for TVET in Malaysia in equipping students from secondary schools with relevant working skills and competencies, to help them function effectively in future.

Also, it is hoped that with such preparation, the shortage of labour and incompetent workers will be effectively solved through education. However, the question remains is how does education can prepare students for their future work.

In the recent works (Nagendra et al., 2013; Odora & Naong, 2014; Usman & Tasmin, 2015) in the area of TVET education, they agreed that an industry-based curriculum is an alternative to above problem. Nagendra et al. (2013) view industry-based education as a process of developing skills and performances of the future job. They agreed with Wenrich's (1974) notion that knowledge, skills, work attitudes and learners' potential should be addressed in the teaching and learning process. In a different perspective, Odora and Naong (2014) view industry-based curriculum as a process of enriching students' competencies and skills through experiential and entrepreneurship training. Their study has highlighted the importance of having industry experts' partnership to provide relevant training and authentic working experiences for students. Similarly, Usman and Tasmin (2015) highlight the importance of entrepreneurial skills development in enhancing students' work-related competencies and skills. School-industry partnership initiative, the SIWES program, has been introduced in Nigeria in helping "…to bridge the gap between theory and practice…" (Usman & Tasmin, p.256, 2015). This collabouration provides training, educational supports and facilities for learning. In summary, it is apparent that industry-based curriculum seeks to provide extensive learning and skills development, experiential learning opportunities and knowledge development, which is not only restricted to school settings. Wellington (1993) has outlined four general characteristics of an industry-based curriculum. It must:

a. have an established targets and programmes that focus on foundation subjects which are related to the working world in the National Curriculum,

b. have a clear framework to represent the foundation knowledge and skills that is derived from two important themes (the Economic and Industrial Understanding, and Careers Education and Guidance),
c. touch on the development of personal and social skills,
d. introduce specific work-related activities either as part of mainstream education or separately

Firstly, he emphasizes on the inculcation of work-based competencies in foundation subjects in National Curriculum. He further explains that the policy makers, educators determine and local industrial community play an important role to influence the kind of competencies required to be integrated in National Curriculum. Secondly, Wellington (1993) highlights the importance of a framework of knowledge, understanding and skills required for both education practice and work-related competencies. This framework aims to direct and ensure the aspirations of the curriculum are being translated accurately. Thirdly, it has been highlighted that personal and social education that seeks to develop qualities and skills are highly important to industry-based curriculum. Wellington (1993) emphasizes on the development of interpersonal skills and understanding of working systems, which clearly related to social interaction in work field. Lastly, he emphasizes on work-related activities and training. In this context, Wellington (1993) refers to hands-on experiences and training during the learning phase in TVET. He believes that this opportunity will bring benefit and help to enhance students' work-related competencies. In short, these four elements are the beacon in understanding the characteristics of industry-based curriculum. The integration of work-based competencies in National Curriculum, development of a relevant TVET framework, personal and social education programmes, and inculcation of work-related activities, should be the foundation in designing an industry-based curriculum.

The Current Practices of An Industry-Based Education.

It has been deliberately discussed in previous section, that these four characteristics are very prominent in the development of an industry-based curriculum. This section offers the evidences of the practice of industry-based curriculum in justifying its importance and relevancy to the development of work-related competencies.

The integration of industry-based targets and programmes in the National Curriculum. Searle's (2009) work has explored the principles of integrated training programme in TVET settings. Her work concerns on the development of literacy at work as she deliberately discusses the importance of literacy and its relative contribution to work. This is in line with Wellington's (1993) framework of workplace-school competencies and foundation skills (refer to Table 3, Technical Communication section). Both authors agreed that literacy as an important foundation in developing work-related skills. In fact, other researchers, such as Minghat and Yasin (2010) and Ibrahim et al. (2012), similarly highlighted the importance of literacy at work as the foundation to improve communication for work.

Searle (p.1266, 2009) proposed three important stages of integrating training programme in TVET education; a) orienting, b) enhancing, and c) synthesizing. In the first stage, orienting, the focus should be given on:

a. understanding students' prior knowledge of the literacies at work
b. assessing student's prior knowledge on the topics introduced
c. demonstrating the practicality of the learning

d. introducing new technical terms and knowledge during teaching and learning process.
e. introducing language of instruction and assessment.

In this initial stage, the instructors must first understand the literacies at work and competencies required in the field of work (Searle, 2009). The above guidelines are used to ensure that the teaching and learning is pitched at an accurate level. Since literacy is a foundation to workplace-school competencies (Minghat & Yasin, 2010; Wellington, 1993), orienting phase should be given an extra emphasize. In the second stage, enhancing, Searle (2009) describes this stage as the process of enhancing the mastery multiple literacies- new technical and vocational knowledge, and other relevant literacies. This stage considers:

a) providing authentic experiences in teaching and learning
b) enhancing opportunities to work independently and collabouratively
c) learning 'insider terminology'
d) learning site-specific documents and workplace culture.

Searle (2009) has exemplified relevant literacies at work, such as competencies in completing authentic tasks, intrapersonal and interpersonal skills, and content-specific knowledge. Consistently, other researchers have highlighted the importance of these elements in the integration of work-related skills in national curriculum (Minghat & Yasin, 2010; Preves & Mortimer, 2013; Ueno, Kimura, Neudorfer & Maclean, 2004; Wellington, 1993).

Lastly, Searle (2009) describes synthesizing phase as an internal process where students link their previous and new knowledge together in forming their own '…conceptual framework, as a basis for further thought and action." (p.1267). She suggested reflective activities or tasks to be employed in maximizing the outcomes of the learning. In Nigendra et al.'s (2013) work, they mentioned that the generic and technical competencies should work hand in hand to produce competent workers. It is very apparent that in achieving this, learnability is the key. They further elabourated that possessing an excellent communication skill in both oral and written, combined with learning from experiences help to enhance synthesizing process.

What have been presented in Searle's (2009) is not only restricted to literacy at work only. Other researchers, such as Minghat and Yasin (2010) and Oxtoby (1997) have similarly discussed the integration of industry-based targets and programmes in relation to the TVET institutions in their respective countries. Minghat and Yasin 's (2010) study focuses on analyzing on sustainable elements of TVET institutions in Malaysia. Their findings suggested that in integrating workplace-school competencies in Malaysia, elements such as creativity, innovation, generic skills, entrepreneurship, ICT skills, knowledge and other elements should be treated equally. They further elabourated that hands-on experiences and field training should be integrated in TVET curriculum in Malaysia. With the 70:30 ratios of practical skills and academic knowledge in Malaysian TVET (Ministry of Education, 2012), the proposed elements in Minghat and Yasin's (2010) study are deemed to be relevant as most of the elements are aimed to produce knowledgeable and skilful workers.

The framework for the development of knowledge, understanding and skills framework in TVET. Wellington (1993) highlights the importance of integrating 'Economic and Industrial Understanding' and 'Careers Education and Guidance' in developing a relevant framework for knowledge, understanding and skills in TVET. He further describes 'Economic and Industrial Understanding' as a mean to develop knowledge and skills "...as citizens: wherever they themselves personally may end up, they need to have some understanding of the way in which the world of work is structured…" (p.41). This notion clearly reflects the importance of introducing students to the world of work in education, especially on what is expected by the industry- the skills, knowledge, competency and understanding of how an organization functions. This is closely related to the Organizational Assimilation theory (Jablin, 1987) because in Vocational Anticipatory Socialization until Metamorphosis stage, understanding and knowledge on how an organization is structured and functions, are very important to help the newcomers to learn and develop competency expected by the organization.

In addition, this notion has a strong relation to the aspiration of one's country. What is viewed and aspired by a particular country will then be translated into education as the mean of realizing this. Whereas, 'Careers Education and Guidance' is viewed as a medium to "…help individuals, in their role as potential future workers, to have a base which they can make decisions and transitions that will determine their own working lives." (p.41). It is undeniable that both strands have a strong and relative contribution to each other, and in fact, Wellington (1993) believe that these strands are achievable through the preparation in schools and abundance exposure to learning at work experiences. Therefore, a sound framework should reflect these two strands.

Tabbron and Yang (1997) have reviewed the TVET development and practices in advanced countries. Their study has addressed important key elements that reflect both elements (Economic and Industrial Understanding, and Career Education and Guidance) as proposed by Wellington (1993). Their findings noted that the reform of TVET in advanced countries has benefited them at large. In achieving this, the advanced countries focus on providing a quality education for all. In achieving this, an early introduction of technical and vocational in secondary level has been practiced. For instance, in the United States, the Career and Technical Education subjects have been introduced in Grade 9. According to Careertech (2014), the National Career Clusters framework is the guiding beacon to its implementation. This framework covers 16 working clusters that introduce more than 79 future career paths for students.

In addition, TVET in advanced countries also consider the effort to strengthen industry partnership for teaching and learning improvement. Since the general concept of an industry-based education is to produce knowledgeable and skilled workers for the industry, industry involvements are very prominent. As described in Chapter 1 (Statement of Problem), studies such as by Mourshed et al. (2014), Nagendra et al. (2013), and Oxtoby (1997) have identified the mismatch between education outcomes of TVET institutions and the needs of industry, which has resulted in increasing unemployment among TVET graduates. Therefore, it is very important to maximize the involvement of industry in teaching and learning of TVET institutions. For instance, in Korea, the TVET institutions, including the Meister schools have established a strong partnership with the industry. According to Park (2011), through this partnership, new courses and improvements have been implemented in TVET institutions in Korea. For example, new media, mechatronics, and telecommunication have been introduced as early as in secondary school, in ensuring the production of high-skill workers for the country.

In a localized context of Malaysia, the Malaysian Skills Certification Framework as proposed by the Department of Skills Development (2012) clearly reflects types of competencies required in producing more skilled and knowledgeable workers. Yunos, Ahmad, Kaprawi and Razally (2006) has provided the descriptions of the Malaysian Skills Certification Framework as presented in Table 2.14 below.

Table 2.14 *The description of the Malaysian Skills Certification Framework.*

Qualification awarded	**Levels of the SKM Qualification Competencies achieved**
Level 5 (Malaysian Skills Advanced Diploma)	Possession of the necessary competence so as to be able to apply a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts.
Level 4 (Malaysian Skill Diploma)	Competent in performing a broad range of complex technical or professional work with a substantial degree of personal responsibility and autonomy.
Level 3	Competencies in performing a broad range of varied work activities that are performed in a variety of contexts, most of which are complex non-routine.
Level 2	Competent in performing a significant range of varied work activities that are being performed in a variety of contexts. Some are non-routine, requiring individual responsibility and autonomy.
Level 1	Competent in performing a range of various job/tasks that are mostly routine and predictable.

Source: Yunos et al. (p.10, 2006).

In assessing the students, teaching and learning in Malaysian TVET follow the outlined principles of the Malaysian Skill Certification Qualification framework, which emphasizes on:

a. providing technical and career development training, which are parallel to the academic-based certification
b. encouraging life-long learning and upward mobility for skilled workers
c. producing highly competent, qualified and skilled workers
d. adding value to the existing TVET in ensuring the marketability of graduates
e. providing foundation for trainees from both public and private institutions and achieving a standardized qualification level
f. enhancing the corporate image of TVET institutions
g. enhancing the status of skilled workers in Malaysia

(Adapted from Yunos et al.'s (p.10, 2006) work).

In short, the Malaysian Skills Certification framework is in line with the notion of developing competencies for work. As presented above (Table 8), the introduction of different levels of certifications will allow students to further their education beyond vocational college (Level 1-2). In each certification level, students are expected to achieve basic competencies which concern on development of technical knowledge and skills. This reflects Jessup's (1968) notion (which recently is widely discussed in Wellington's (1993) and Chapman's (2011) work) of developing 'mental' and 'manual' element for technical competencies.

Linking the presented frameworks with Wellington's (1993) idea of a sound TVET framework, it is clear that these frameworks specifically follow what he mentioned as 'Economic and Industrial Understanding' and 'Careers Education and Guidance'. In the work of Tabbron and Yang (1997), the advanced and recently the developing countries are employing this framework. Vocational subjects have been introduced in the National Curriculum and in fact have been widely introduced in post-secondary and tertiary education. It is also being emphasized that competency-based curriculum and partnership with industries are relevant to maximize the quality of the graduates. With such effort, students will become more familiar with 'Economic and Industrial Understanding' as they start to learn the inside of the working world form their first-hand experiences and training with the industries. Also, with widening opportunities for employers to be involved in TVET process, relevant training and guidance can be directly given not only from the instructors but also the industry experts, and thus help to achieve what has been termed as 'Careers Education and Guidance'.

It is undeniable that Malaysia is implementing the similar framework as outlined by Tabbron and Yang (1997). In the Malaysian Skill Certification

Qualification framework, Yunos et al. (2006) described that Malaysian TVET process concerns on technical and career development training. In achieving the goals of producing more skilled workers and maximizing students' foundation knowledge and relevant competencies, Malaysian TVET has focussed on providing quality teaching and learning and industry partnerships as outlined in the Malaysia Education Blueprint 2013-2025 (Ministry of Education Malaysia, 2012). Again, these efforts are in line with Wellintion's (1993) notion of developing 'Economic and Industrial Understanding' and 'Careers Education and Guidance'. In addition, the Malaysian Skills Certification Framework addresses the importance of acquiring the workplace-school competencies and foundation skills in various context of learning and technical training. In achieving Level 5, a student is expected to be competent and skilful, and demonstrate these skills in both learning and training settings. Ideally, these frameworks are relevant to produce more skilled and knowledgeable workers for future due to constant efforts in nourishing 'Economic and Industrial Understanding' and 'Careers Education and Guidance' among students.

Personal and social education in TVET and the inculcation of work-related activities and training in TVET curriculum. Wellington (1993) describes that a work-related curriculum should be focussing on introducing and developing working competencies that are relevant to the current industry needs. Thus, he suggested that learning activities that mirror real work experiences to be integrated in TVET curriculum. The importance of equipping students with work-related competencies has been widely established in literature (Eckert, 2008; Ibrahim et al., 2012; Lang et al., 1999; Mourshed et al., 2014). Apprenticeship is one of the widely practiced training in the field of technical. It is undeniable that apprenticeship is a relevant platform to develop work-related competencies (Odora & Naong, 2013;

Usman & Tasnim, 2015). Apprenticeship training is not restricted to develop technical skills. This training provides and exposes students to organizational communication that is significant to their professional development. For instance, in Odora and Naong's (2014) study, they have found that experiential training, with major emphasis on hands-on activities has helped students to be confident and efficient at work. After the training, the students rated themselves as adequately prepared for their future work. According to Odora and Naong (2014), the concept of apprenticeship is long rooted in Knight's (1921) notion of learning by imitating the trainers. However, this concept has been expanded not only to imitating but also to encourage students to take initiative and challenges at work. In addition, apprenticeship in TVET context is also a significant platform to help students to practice their socialization and communication skills. In the previous section, we have learned that literacy at work is a key to successful learning and training (Searle, 2009). In encouraging the quality of training, Searle (2009) proposed curriculum designers to consider the development of language of work as part of an effective training or apprenticeship programme. To improve literacy at work is to encourage organizational socialization. Reio and Callahan (2004) noted that effective communication and socialization help to students to self adjust to the work field, understanding their roles, and to know the function of each member in a working setting.

Similarly, in TVET frameworks, such as in Minghat and Yasin's (2012) and in Nagendra et al's (2013) study, have focussed on the development of communication and training in TVET process. In addition, in the previous section, we have learned that in order to produced skilled workers, the teaching and learning in TVET institutions should focus on nourishing 'Economic and Industrial Understanding' and 'Careers Education and Guidance' among students.

With the rapid changes and renewed demands for human resource, Tabbron and Yang (1997) have addressed the importance to provide technical training to TVET students with relevant training to the market needs. Of importance, Tabbron and Yang (1997) have established that the advancement of technology has made TVET process to be intensified. In the climate of the advanced countries, there is an urgency to produce workers with multiple skills or flexible specialists, and with competent personal and social skills. Therefore, as the next step, it is highly recommended that TVET institutions to focus not only in providing excellent practical training but also to develop communication skills for the technical field.

An Industry-Based Technical Communication Pedagogical Model for Malaysian Vocational Colleges.

Based on the above discussion (the Industry-based Curriculum), there are three important elements in designing an ideal industry-based curriculum: a) integration of industry-based targets and programs in the National Curriculum, b) development of framework for knowledge, understanding and skills development, and c) inculcation of personal and social education and work-related activities. These elements are also parallel to the curriculum development process, as described in Tyler's Planning model (1949). The relationship between Tyler's Planning model (1949) and industry-based curriculum (Wellington, 1993) is presented in Figure 2.29 below. The first element of an industry-based curriculum, "Integration of industry-based targets and programs in the National Curriculum can be seen as the process of establishing learning objectives in Tyler's Planning model (1949). An ideal industry-based curriculum must consider the current needs of the industry and translate them into competency development in curriculum (Wellington, 1993). Searle (2009) supported that in achieving this, the process of “orienting” or understanding students’ prior knowledge and aligning it with new knowledge, “enhancing” or providing authentic experiences for learning, and “synthesizing” or knowledge and competency development, are very important to be considered in establishing the objectives and later in designing learning experiences.

Secondly, the element of developing framework for knowledge, understanding and skills reflects three stages in Tyler’s (1949) model (“Establishing learning objectives”, “Selecting learning experiences” and “Evaluating curriculum”). According to Wellington (1993), the framework should provide an organized and clear guideline for curriculum implementers in realizing and monitoring their practice. He further highlighted two important components for this curriculum: “Economic and Industrial Understanding” and “Careers Education and Guidance”. These two components are the guide to develop the content of learning. Therefore, this element has a direct relation to learning objective, learning experiences and assessment in TVET institutions. Previously, it has been discussed how the Malaysian Skills Certification framework (Department of Skills Development Malaysia, 2012) serves as the guideline for the types of competencies that need to be developed and achieved according to the levels of certification. In this framework, Yunos et al. (2006) stated that the development of assessment measure should consider how efficient is: a) the technical and career training, b) the development of life-long learning, and c) the development of technical knowledge and skills. Hence, it is clear that the element of “development of framework for knowledge, underrating and skills” is related to Tyler’s (1949) model. Lastly, the element of “personal and social education, and inculcation of work-related activities” is related to both “selecting learning experiences” and “organizing learning experiences”. Wellington (1993) highlighted social competency as the foundation of work competency. The importance of social competence to working filed has been established in the literature (Brinkman & van der Geest, 2003; Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997; Rus, 2014; Tabbron & Yang, 1997) as it will help the graduates to function effectively not only in an organization but also before joining the organization, such as during interviews. In realizing the social development and to provide work-related activates in TVET institutions, it should start in the process of selecting and organizing appropriate learning experience. In the current practice, it has been witnessed that technical communication courses in a number of TVET institutions have carefully selected and organized them in learning experiences. For instance, in the Engineering schools in the United States and Canada, Reaves (2004) mentioned that the curriculum implemented across both countries has considered the development of social skills and inculcation of work-related activities. For instance, field training, and report writing and presentation activities based on authentic Engineering problems were widely used in these institutions. In fact, in the practices of TVET in secondary level in advanced countries have similarly integrated the work-based learning activities as the core learning focus. For instance, in Australia, the National Centre for Vocational Education Research (NCVER) (2007) stated that the training packages were designed based on authentic industry experiences, and thus the teaching and learning are aimed to train students as early as in the secondary level. Also, in Korea, the Meister schools have imported industry experts to work together with academicians as instructors in training students to acquire the technical knowledge and skills (Park, 2011).

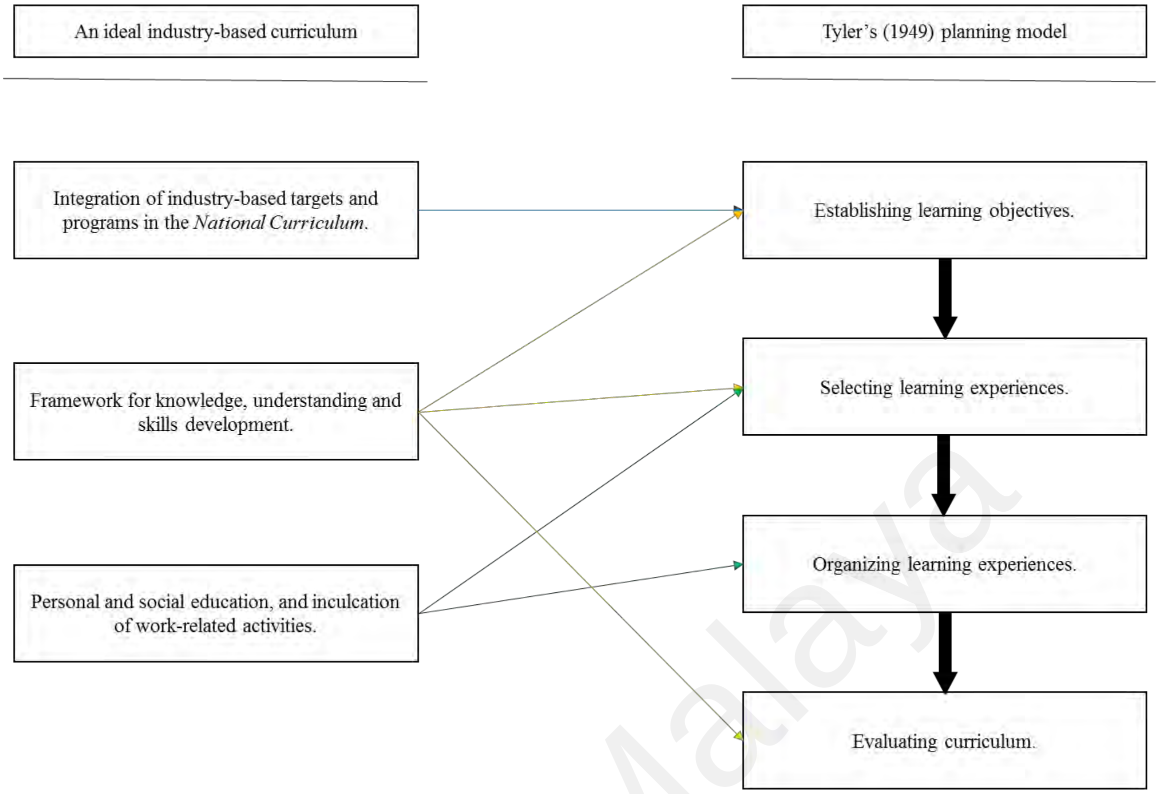


Figure 2.29 The relationship between the elements of an ideal industry-based curriculum and the Curriculum Planning theory.

Even though the industry-based curriculum is an ideal curriculum for TVET institutions, it is found that the issue of poor technical communication skills has plagued its effectiveness in developing "mental" and "manual" elements. In earlier chapter (Chapter 1), this issue has been discussed in a greater detail. The poor mastery of technical communication skills has resulted in poor employment among TVET graduates (Brinkman & van der Geest, 2003; Cook, 2002; Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997), including Malaysia (Ibrahim et al., 2012). In resolving this issue, the current study proposes the development of an industry-based technical communication pedagogical model for Malaysian vocation colleges as presented in Figure 2.30 below. The development of pedagogical model is found to be relevant as it primarily concerns on the interpretation of theories in practice (Batista et al., 2010; Samuelowicz & Bain, 1992; Watkins & Mortimore, 1999). In achieving this, both elements of an ideal industry-based curriculum (Wellinton, 1993) and technical communication skills (McMurrey, 2002; Mitchell, 1962; Rus, 2014) are combined and harmonized in producing an industry-based technical communication pedagogical module. This process also includes the TVET and industry experts' opinions, to model development in ensuring the proposed pedagogical model is relevant to Malaysian Vocational Colleges.

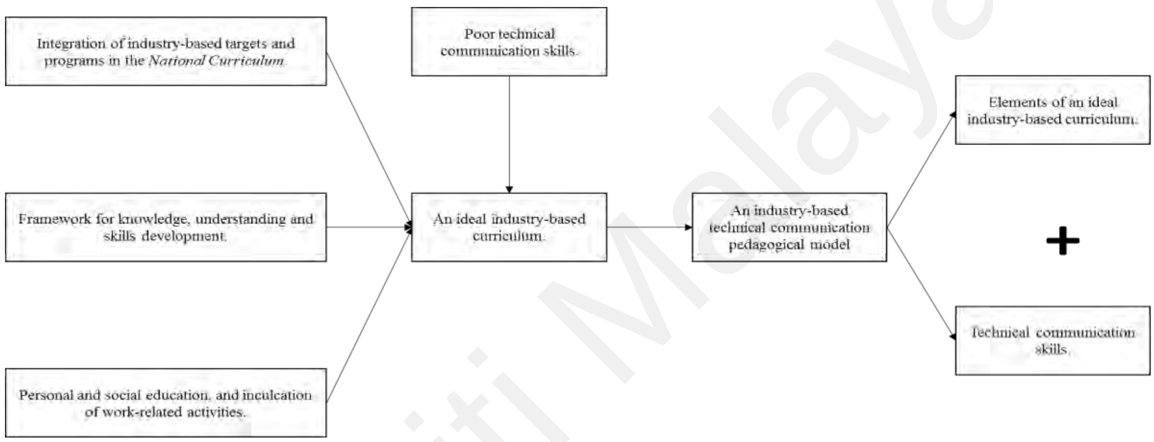


Figure 2.30 The development of an industry-based technical communication pedagogical model.

Conclusion

In short, the development of pedagogical model in this study is based on the prominent elements of an industry-based curriculum and technical communication skills. The importance of integrating industry targets, developing framework of knowledge, understanding and skills, developing social skills and work-related skills are the guiding elements for this pedagogical model. In the next chapter (Chapter 3), an in-depth description of this process is further discussed.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

This chapter covers the overall methodology that is applied in the current study. It discusses the research design, population and sampling, instruments, and other relevant aspects of the research.

Purpose of the Study

In previous section, it has been outlined that the general purpose of this study is to propose technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges. In doing so, the study is aimed to realize these objectives:

a. to identify the key determinants of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges from industry and TVET experts' perspectives
b. to propose technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges.

In order to achieve this, the current study starts with an extensive review of literature as the basis for needs analysis. The needs analysis is conducted using Fuzzy Delphi Method (FDM) to identify key components of this model. The findings of the FDM are used to develop a survey questionnaire to be administered on English language instructors in Malaysian Vocational Colleges. Later, a proposed model and its components are being analyzed using Structural Equation Modelling (SEM). The final product, which is technical communication skills pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges, will serve as a point of reference for implementation in these colleges.

Research Design

As mentioned earlier, this study combines FDM and survey design for conventional approach of SEM as proposed by Kaplan (2012). In answering the first research question (What are the key determinants of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges from industry and TVET experts' perspectives?) and the sub research questions (that focus on identifying the prominent elements of objective, content of learning, method of delivery, assessment method for the model, importance of the model to teaching and learning, and importance of English language proficiency to the model), the needs analysis is conducted using Fuzzy Delphi method (FDM). A set of FDM instrument is developed based on an extensive review of literature.

In the current study, the main problems are identified in the current body of literature. In the earlier chapter (Chapter 1), it has been discussed how the poor unemployment is rooted in poor communication skills among TVET students (Mourshed, Patel & Suder, 2014; Nagendra, Radha & Naidhu, 2013; Oxtoby, 1997; Tabbron & Yang, 1997). Thus, developing technical communication pedagogical model for Malaysian Vocational Colleges is very potential to help overcome this problem.

The FDM is relevant to be employed for needs analysis as it focuses on gathering experts' opinion and consensus on the important suggestions or ideas of a specific area of study (Kaufman & Gupta, 1988; Pipino & Gigch, 1985; Siraj, Alias, DeWitt & Hussin, 2013). For this study, 17 experts are selected from industry and

TVET institutions.

Secondly, in answering second research questions (What are the pertinent elements of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges according to English language vocational college instructors?) and the sub research questions (that focus on the prominent elements of objective, content of learning, method of delivery, assessment method for the model, importance of the model to teaching and learning, and importance of English language proficiency to the model), a survey questionnaire is developed based on the findings of FDM, and later administered to English language instructors in Malaysian Vocational Colleges. Chua (2012) highlights that a survey questionnaire is beneficial in gaining insights directly from target population and the results usually are generalizable to the population. Hence, for this study in developing the model that is relevant to students in Malaysian Vocational Colleges, the insights on the relevant components of the model are gathered from the opinions of English language instructors in Malaysian Vocational Colleges.

Later, using the statistical methodology, SEM, the proposed model is developed and tested. Byrne (2010) mentioned that once proposed model has been specified, the data for each variable need to be tested. Typically, in social and behavioural science studies, theories are often constructed from unobserved variables, known as latent variables (Ramayah, Cheah, Chuah, Ting & Memon, 2018). Therefore, an extensive analysis of these latent variables which are represented by observable mechanism, often called as observed or manifested variables. The complex relationship between observed variables, and between observed to and unobserved variables can simply computed using SEM. There are two types of SEM that are used in research: covariance-based (CB-SEM) and variance-based (VB-SEM). Building up from factor analysis and path modelling, which were initially proposed by Spearman in mid 1900s, other prominent figure such as Jöreskog and his colleagues in 1970s has started to apply SEM (Ramayah et al., 2018). During that time the proposed CB-SEM, a combination of confirmatory factor and path analysis was used to examine the differences between theoretical representation of variables with observed data through the analysis of the covariance matrix. Along that way, Ramayah et al. (2018) mentioned that the goodness-of-fit is used to conclude if the model fits the data or otherwise. Interestingly, Wold (1985) has proposed VB-SEM, named PLS-SEM (Partial Least Square SEM) that majorly focuses on prediction or estimation of proposed theroretical model from the observable data and is computed using the variance-based approach (Garson, 2016; Ramayah et al., 2018).

Jöreskog (1993) mentioned that there are three strategic frameworks in testing structural equation models: a) strictly confirmatory (SC), b) alternative models (AM), and c) model generating (MG). Typically, model-generating framework is applied. According to Jöreskog (1993), MG framework is used to develop a statistically fit and meaningful model. Siddiqui (2015) supported that in building the model, MG is typically used in research as it allows modification if the proposed model is found deficient based on the collected data. The changes are thus tailored to SEM modification indexes. Rather than to confirm the proposed model, PLS-SEM is found to be more suitable in predicting and exploratory modeling (Garson, 2016; Ramayah et al., 2018). However, Hair, Hult, Ringle and Sarstedt (2014) and other researchers (Garson, 2016; Gefen, Straub & Boudreau, 2000; Ramayah et al., 2018) cautioned that the selection between CB and VB-SEM is depending on purpose of research and data collected. It is noted that PLS-SEM (or VB-SEM) is more appropriate when the study is more to exploratory and predicting key components of a proposed theory (Garson, 2016; Ramayah et al., 2018).

In this study, the PLS-SEM is selected based on these reasons:

a) the research goals.

As established in previous two chapters, the objective of this study is to propose technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges. In realizing this, with limited guiding theories and frameworks of technical communication implementation in other TVET institutions, there is no clear direction to confirm the relevant objectives, content of learning, method of delivery and assessment to develop technical communication skills in the context of Malaysian Vocational Colleges. Borrowing Ramayah et al.'s (2018) lenses on the suitability of PLS-SEM in exploratory study, the current study is geared towards predicting the key components of the model and at the same time to explore how these proposed components contribute to technical communication skills pedagogical model development. This is further supported by Henseler, Ringle and Sinkovic (2009) where they specifically mentioned that PLS-SEM is more appropriate for initial stage of theoretical development, which also allows researchers to test and validate the proposed model.

b) the data characteristics.

Among the advantages of PLS-SEM are in its ability handling non-normal and smaller sample size data as well as in computing complex relationships of different kinds of variables (reflective and formative) (Garson, 2016; Ramayah et al., 2018; Urbach & Ahlemann, 2010). In this study, with a limited number of English language instructors in Malaysian Vocational Colleges (population of 435 instructor, across all 81 colleges), a maximum number of 205 instructors were selected as the research participants for SEM analysis. The total of 205 research participants is considered a poor sampling for CB-SEM as according to Kline (2010) a large sample is required to establish a stable estimation of covariance. MacCallum, Browne, and Sugawara. (1996) cautioned that in achieving a good fit of a model (one of it is Root Mean Square Error of Approximation, RMSEA) and to achieve a power value of 0.80, the minimum sample required is 231 with degree of freedom of 41. Because of the sensitivity of CB-SEM to sampling size and limited number of respondents for this study, PLS-SEM is employed. In addition, the distribution of the data is non-normal. Hence, PLS-SEM is the best alternative since normality of the data is not the main concern in the analysis (Garson, 2016; Hair et al., 2017; Ramayah et al., 2018), and through bootstrapping function (available in SmartPLS), the resampling method makes possible to compute the significance testing (Garson, 2016).

Based on the above justification, it is relevant to state that PLS-SEM is an appropriate method to be implemented in this study.

The needs analysis. In answering the first research question (What are the key determinants of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges from industry and TVET experts' perspectives?) and the sub research questions (that concern on identifying the prominent elements of objective, content of learning, method of delivery, assessment method for the model, importance of the model to teaching and learning, and importance of English language proficiency to the model), the needs analysis is conducted using FDM. Ellis and Levy (2010) describe this as a process of identifying the problem, describing the objectives of the study. In the current study, the main problems are identified in the current body of literature. In the earlier chapter (Chapter 1), it has been discussed how the poor unemployment is rooted in poor communication skills among TVET students (Mourshed, Patel & Suder, 2014; Nagendra, Radha & Naidhu, 2013; Oxtoby, 1997; Tabbron & Yang, 1997). Thus, developing technical communication pedagogical model for Malaysian Vocational Colleges is very potential to help overcome this problem.

The FDM is relevant to be employed in this phase as it focuses on gathering experts' opinion and consensus on the important suggestions or ideas of a specific area of study. This is in line with Ellis and Levy's (2010) suggestion that in designing and developing model or module, the researcher should consider to "…use of expert panels, interviews with potential end users, and a review of the literature." (Ellis & Levy, p.113, 2010). FDM was initially introduced by Murray, Pipino and Gigch (1985). It is a modification to traditional Delphi method, where it employs fuzzy set theory to maximize its accuracy in collecting and representing experts' opinions and consensus on a particular area (Siraj, Alias, DeWitt & Hussin, 2013). Kaufman and Gupta (1988) supported that the use of FDM in a research helps to verify and achieve consensus of the proposed items from literature and suggestions from selected experts. Thus, this is a suitable method to help collect, analyze and represent experts' opinions for this study.

Procedure to conduct FDM. Generally, there are five major steps in conducting FDM as illustrated in Figure 3.1 below. The first stage is defining problem. The review of literature indicated that poor mastery of communication skills among TVET graduates has affected their employability (Mourshed, Patel & Suder, 2014; Nagendra, Radha & Naidhu, 2013; Oxtoby, 1997; Tabbron & Yang, 1997). Even though the current studies have appointed the importance of technical communication skills in enhancing TVET students' communication competencies, there are still uncertainties on its representations across different contexts of curriculum (Cook, 2002; Reaves, 2004) and an effective delivery method in introducing technical communication skills (Reaves, 2004). With limited guiding studies in Malaysian context, there is a need to propose a pedagogical model that identifies prominent elements of technical communication skills- the literacies, practices and delivery methods.

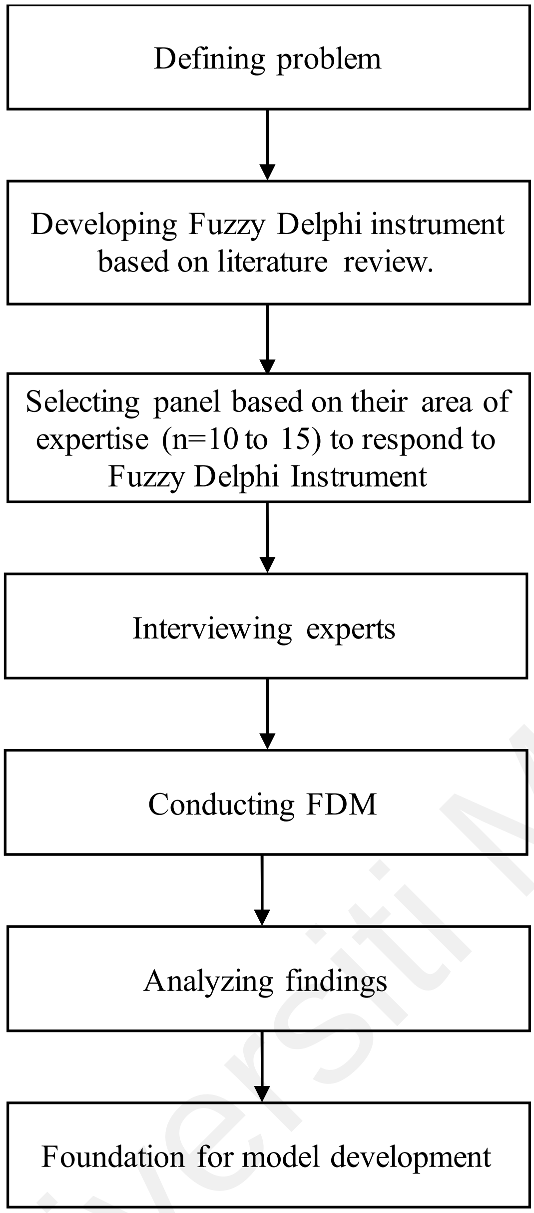
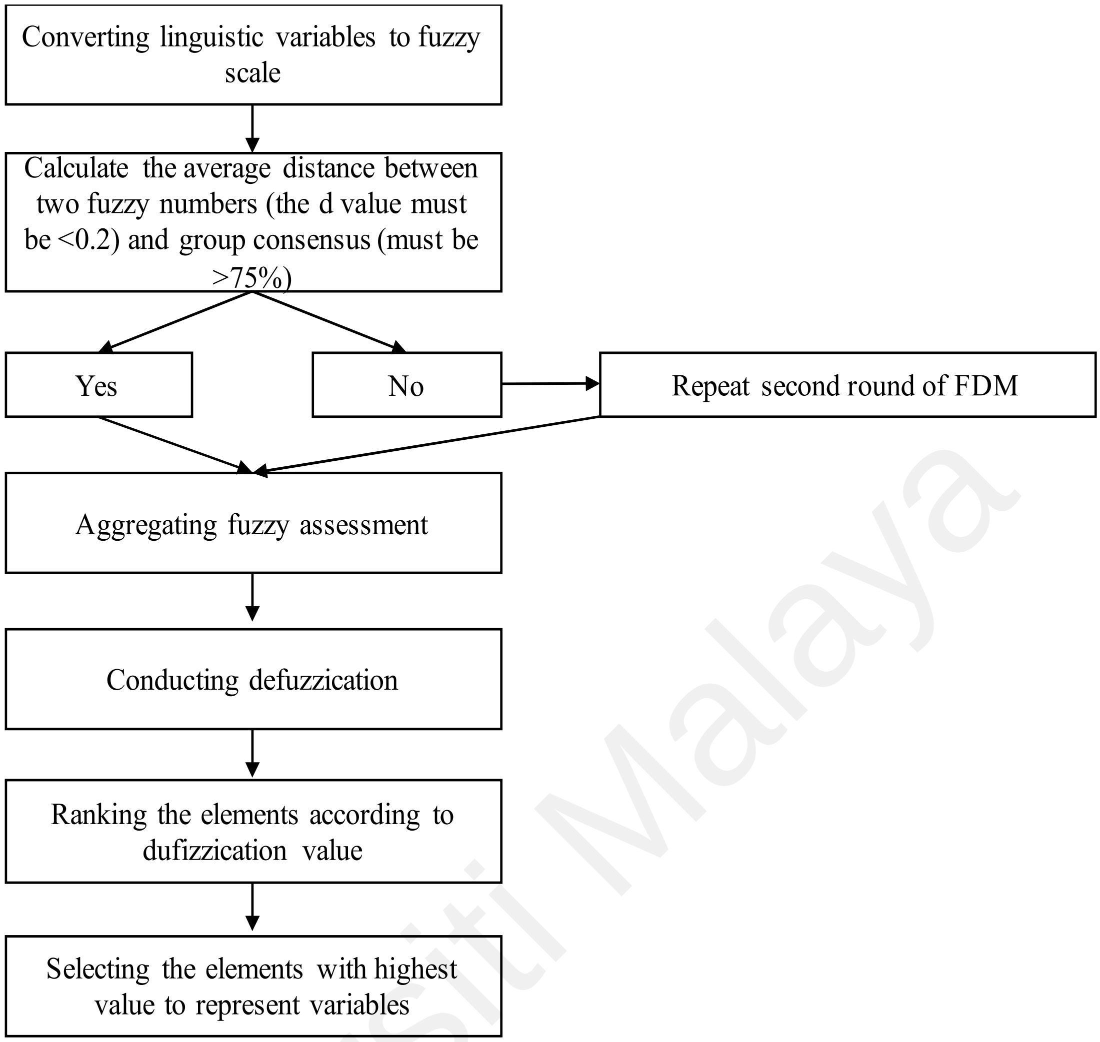


Figure 3.1 General steps to conduct FDM.

Based on this problem, the process starts with a critical review of literature in order to develop the foundation of FDM instrument and finally for the model development. The review of literature has provided the basis of important components for the industry-based technical communication skills pedagogical model. Previously, it has been established that four major components of curriculum that should be developed: objective, content of learning, method of delivery and assessment method.

In addition, two components (for independent variable and mediator) are also derived from the review of literature. Since the literature on technical communication are from international context, it is important to link these to the localized context of Malaysia. In achieving this, a panel of experts is identified and participated in this study, as their opinions are very important in developing the industry-based technical communication pedagogical model in the context of Malaysia.

In this study, 17 experts from industry and TVET institutions are identified and selected as the panel. First, an interview with five experts is conducted to help develop and modify the items that are developed from the literature, as the basis for FDM instrument. In this stage, an open-ended interview is conducted on two industry experts and three TVET experts. Their responses to the open-ended questions are analyzed thematically. The experts have added and suggested deletion of a number of items. Next, the modification is made to the FDM instrument and is administered to all selected panel of experts. Data of FDM are analyzed according to the steps suggested by Siraj et al. (2013) as illustrated in the following figure (Figure 3.2).



Adapted from Siraj et al. (2013).

Figure 3.2 The process in Fuzzy Delphi method.

The experts' responses to the instrument, in the form of linguistic variables are converted to fuzzy scale. In the next stage, the average distance between two fuzzy numbers and group consensus are calculated. According to Siraj et al. (2013) the value of spacing of two fuzzy numbers should be smaller than 0.2 (d<0.2). Also, the group consensus percentage should be more than 75% to indicate that the expert consensus has been achieved. If both values have been achieved, the fuzzy assessment value should be aggregated. Then, defuzzification is conducted in order to convert the value to crisp real number. The items or elements can be ranked according to defuzzification value to indicate the most agreeable element for each variable. However, if the value of average distance between two fuzzy numbers are bigger than 0.2, the second round of FDM should be conducted until the value is smaller than 0.2, with a group consensus higher than 75%. Finally, the items with high consensus are used as the foundation model development.

In short, the findings of the needs analysis sets a foundation to develop the model. This is followed by administration of survey on English language instructors in Malaysian Vocational Colleges. The data are analyzed using the statistical methodology, SEM, in order to develop and test the model.

Research participants for FDM. For this study, 17 experts are identified and selected for this phase using purposive sampling technique. Purposive sampling technique is as a process of selecting research participants based on specific characteristics to suit the purpose of the study (Chua, 2012; Idris, 2010). Relevant to the first research question, 17 experts in this study are selected based on their knowledge and experiences in TVET training and working field. According to Adler and Ziglio (1996), the FDM requires at least 10 to 15 experts in achieving a higher level of consistency among their opinions. In this study, two groups of experts are identified: industry and TVET experts. The selection criteria for selection of experts are first established. For the TVET experts, the selected individual must:

a. have master’s degree or doctoral degree in the area of TVET,
b. have at least five years of teaching experience in the technical or vocational education field,
c. have experiences in fieldwork training for students.

On the other hand, for industry experts, they must:

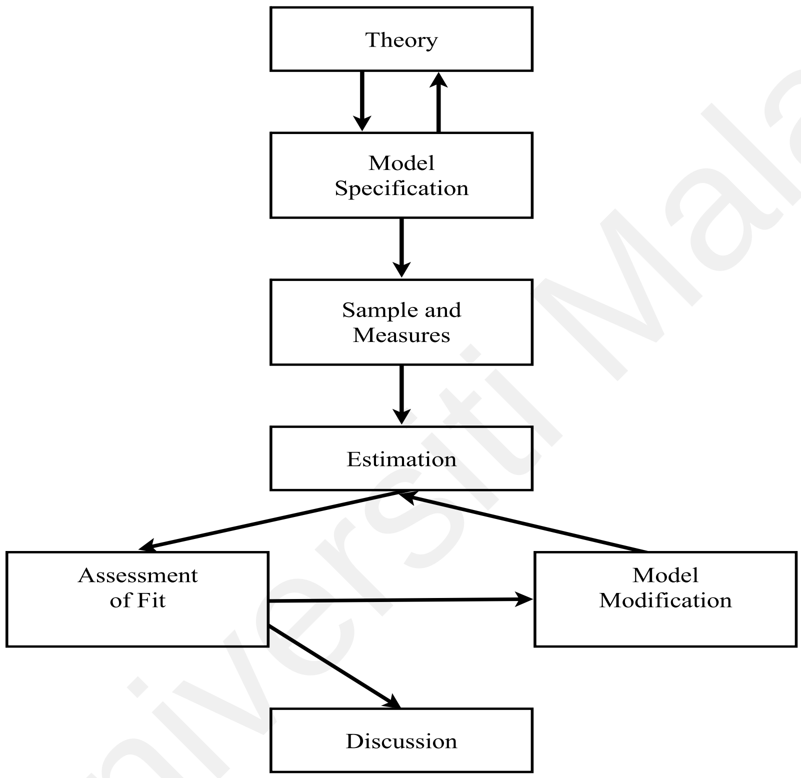
a. have at least a diploma/Malaysian Skills Certificate Level 4 or degree in their respective field of work,

b. have at least five years of working experience in the industry,
c. from a company that provides fieldwork training for students from TVET institutions,
d. have experiences in monitoring and training students from TVET institutions.

The above criteria are established based on the belief that respondents' knowledge and experiences in the TVET and industry field are very pivotal to develop the foundation of the model design and development. The criteria for TVET experts are also based on Berliner's (2004) findings which indicated that expertise in teaching can only be developed with experience of teaching between five to seven years.

In addition, in other previous studies, such as Othman, Musa, Mokhtar, Ya'akob, Latiff and Hussin's (2010) study, and Pillai, Khan, Ibrahim and Raphael's (2012) study, they similarly selected participants from organizations that provide practical training for students and have experiences in training these students. Othman et al. (2010) justified that the experts' opinions are relevant to be considered as they are directly and actively involved with students' field training and skills development. In addition, in the current practice of the Malaysian Vocational Colleges, industrial training is an important component to help students apply their theoretical knowledge in a real working setting and to further develop students' working skills and competencies (MOE, 2012a). Therefore, in this study, the outlined criteria are relevant as both components (experts' knowledge and experiences in their field) are being considered in the selection of experts.

The development of industry-based technical communication skills pedagogical model for Malaysian Vocational Colleges. In the conventional practice of SEM, Kaplan (2000) noted that the model development process must be carefully conducted in ensuring the end result is accurate. As presented in Figure 3.3 below, Kaplan (2000) represented this process as an organized process starting from reviewing the available theories for model specification to selecting sample and measures, estimation, assessment of fit, model modification and lastly, the discussion.



Source: Kaplan (p.8, 2000)

Figure 3.3 The conventional practice of Structural Equation Modeling (SEM).

In developing the model, the very step is to postulate a model based on the review of literature and relevant theories on technical communication skills development. Bryne (2010) explains that the proposed model is then needs to be tested using SEM. In order to do so, she explains that relevant data should be collected. For this study, a survey questionnaire is developed based on review of literature and findings from FDM on components of technical communication curriculum, previous instruments used to measure technical communication (later discussed in Instrument section) and relevant theories (both curriculum development and technical communication theories, in Chapter 2). According to Chua (2012), survey research is typically used to gather direct information from selected subjects of research in order to describe a phenomenon studied by researcher. In achieving this, Chua (2012) has outlined five important characteristics to be considered in developing a good survey questionnaire. The survey is therefore need to:

a. consider respondents' background and is designed to suit their level of knowledge and understanding,
b. have relevant questions that are systematically arranged,
c. have clear instructions to guide respondents in answering the questions,
d. be accompanied by supporting letters and documents in ensuring the return rate is high and to increase their trust on the study,
e. conduct pilot testing in ensuring its reliability. Chua (2012) proposed a total of 30 respondents (from the population) is adequate to run both reliability test.

For this study, once the survey questionnaire is developed based on the findings of FDM, a pilot test is conducted to test both reliability of the instrument.

Later, the survey questionnaire is administered to English language instructors in Vocational Colleges in Malaysia. Then, the data are analyzed using SEM. One of the main advantages to employ SEM is its analysis technique that can help to overcome the weaknesses of the traditional Ordinary Latent Squares (OLS) in analyzing the latent constructs (Awang, 2015; Bryne, 2010). Generally, latent constructs are the constructs that cannot be measured directly. Typically, in a research, a studied phenomenon is represented by theoretical constructs, which cannot directly be observed and measured. In dealing with this issue, Bryne (2010) stated that the latent variables should be operationally defined and to find relevant measure in representing them. Hence, one of the ways to do it is by constructing a questionnaire that reflects these unobserved variables. In the traditional OLS, this approach is incapable to model the interrelationships among latent constructs at a time (Awang, 2015). Therefore, SEM has its significant advantage to role the interrelationships between the variables in a proposed model.

Review of literature and survey questionnaire development. In developing the model, the first step is for this study is to review the relevant theories and elements of technical communication skills, that can be presented based on five main constructs: content of learning, delivery method, assessment method, and the technical communication pedagogical model (Marsh & Willis, 2007; Wellington, 1993). The review of literature is used as the basis for general components of the model. In continuation to the needs analysis phase, the experts' opinions and insights on relevant components and subcomponents of the technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges are used to produce a survey questionnaire for model development and testing. This is aimed to refine the constructs, as the experts have finalized the constructs to represent the variables for technical communication pedagogical model in Malaysian context. Kaplan (2000) added that the model specification stage requires constant reviewing and analyzing until a relevant theory is established.

The developed survey questionnaire is later piloted on 100 English language instructors. Chua (2012) supported that a minimum of 30 research participants from a target population should be used to pilot the developed questionnaire. A reliability test, Cronbach's Alpha Internal Consistency Reliability method is used for this study. Chua (2012) supported that calculation of correlation values between total score of the test with score of each item, helps to determine the reliability of an instrument. If the Cronbach's Alpha value is lower than 0.65, the item should be omitted due to its low reliability value (Chua, 2012).

Once the survey questionnaire has achieved high reliability value, the data collection is conducted across selected Vocational Colleges across Malaysia.

Representing the relationships among the variables. In representing all exogenous and endogenous variables, the SmartPLS is used. Figure 3.4below represents the initial model for this study.

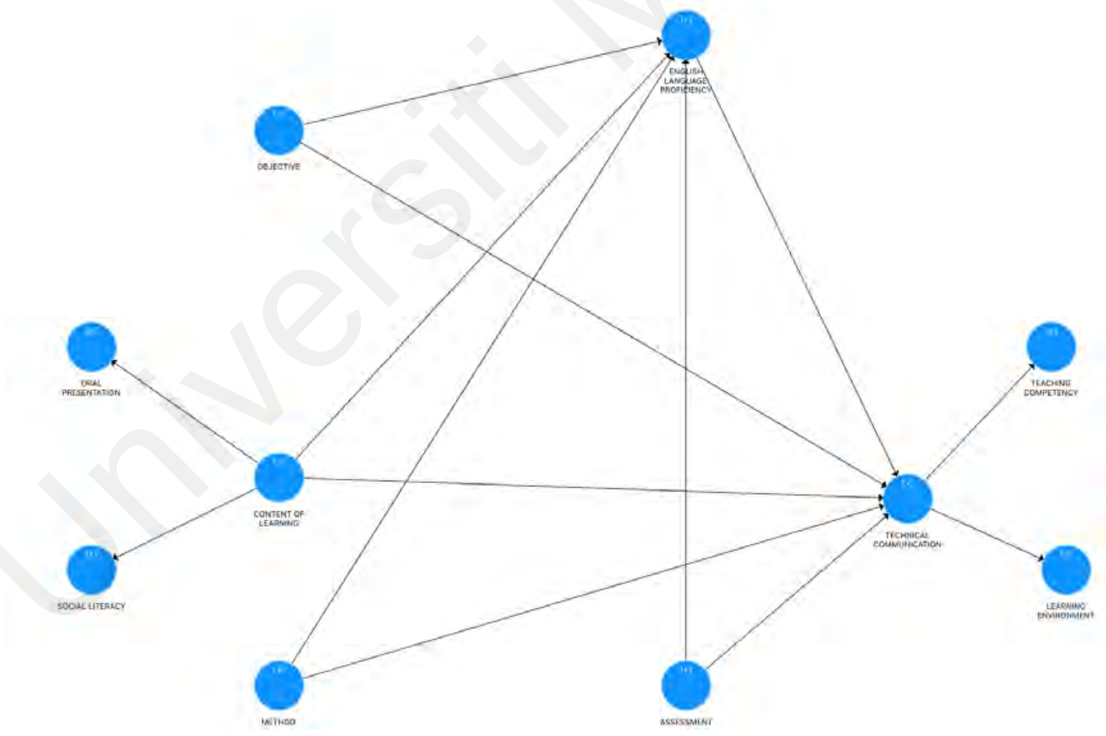


Figure 3.4 The proposed initial measurement model.

A. Determining endogenous and exogenous constructs

Based on the above model, there are five exogenous constructs (Content of Learning has two lower order constructs). Byrne (2010) stated that exogenous constructs are the independent variables that have a contribution to the corresponding dependent variable. In this study, based on the review of the literature, it is found that objective, content of learning, method of delivery, and assessment method are the exogenous constructs that have a contribution to technical communication pedagogical module. Therefore, the perceived importance of technical communication pedagogical model is the endogenous construct. Awang (2015) defines endogenous construct as construct that is dependent to the exogenous constructs. This is supported by Bryne (2010), as she clearly stated that the exogenous constructs will "cause" constant change on the dependent variable. In the proposed model, all other variables are predicted to have a contribution to perceived importance of technical communication pedagogical model. In short, based on this model the effects of all exogenous and mediator on the endogenous construct were investigated.

B. Sample and measures: measurement model and SEM analysis

In the next stage, the sample and measures, the English language instructors across Malaysian Vocational Colleges were selected in order to evaluate the proposed pedagogical model. These individuals were randomly selected from the population. Figure 3.5 below represents the overall process the sample and measure, and estimation phase.

In assessing measurement model, three tests should be conducted: a) internal consistency, b) convergent validity and c) discriminant validity (Chin, 1998; Ramayah et al., 2018). In assessing internal consistency, the measurement model should fulfil three criteria, which are: a) the Cronbach's alpha value must be above 0.60 but not exceeding 0.95, b) the composite reliability (CR) value must be above 0.60 but not exceeding 0.95 and c) the outer loading of each item must be above 0.70 (Chin, 1998; Hair et al., 2017). If these criteria are not met, deletion of items by the lowest loading should be done.

Secondly, the analysis of convergent validity should be conducted. Ramayah et al. (2018) explain that the purpose of this assessment is to measure how the assigned items in a particular construct are reflecting its own construct. Again, the outer loading for each item must be above 0.70 and the average variance extracted (AVE) value must be above 0.50 (Garson, 2016; Ramayah et al., 2018).

Thirdly, the discriminant validity analysis is conducted to ensure that the constructs are not identical to each other (Garson, 2016; Hair et al., 2017). This is conducted by employing Fornell and Lacker's (1981) criterion, where the value of squared AVE should be higher than its correlation with other constructs. In addition, according to Garson (2016) the loading value for each item in its construct should be higher than its cross-loading values. If not, there is an issue with multicollinearity. Also, the Heterotrait-Monotrait Ratio (HTMT) values should be below 0.85 (Kline, 2011). The value is calculated by dividing the mean of heterotrait correlations with mean of monotrait correlations (Garson, 2016).

Once all assessments have achieved its acceptable value, the analysis of structural model should be conducted. Firstly, Ramayah et al. (2018) suggest to check for collinearity through assessing Variance Inflation Factor (VIF) by looking at the "Inner VIF values". It is suggested that the VIF value should be less than 5, indicating no multicollinearity exists in the model. Secondly, through bootstrapping function with suggestion of 5000 subsamples (Garson, 2016), the significance and relevance of relationships should be conducted. An acceptable t-value is above than 1.645 (onetailed) and p-value should be equal or lower than 0.05 (Garson, 2016; Ramayah et al., 2018). In certain cases, Hair et al. (2017) mentioned that the p value equal or lower than 0.10 is also acceptable, especially for exploratory research. Thirdly, the purpose of identifying the R^2 level to measure predictive accuracy of the model (Garson, 2016; Ramayah et al., 2018). This value represent the amount of variance in the endogenous variable explained by the model. The values can be categorized into three: a) weak (0.25), b) moderate (0.50) and c) substantial (0.75) (Hair et al., 2017). Other than that, Ramayah also suggested to run the effect size (f^2) assessment. This is to measure the effect size of the each variable in producing R^2 for endogenous variable. The effect size can be classified into three: a) weak (0.02), b) moderate (0.15) and c) substantial (0.35) (Cohen, 1988). Lastly, the assessment of Q^2 (predictive relevance) should be conducted in assessing the predictive relevance of the path model. This assessment is available on blindfolding function in SmartPLS. Fornell and Cha (1994) as well as Garson (2016) stated that the value should be above 0.00 to indicate that the path model has predictive relevance.

Even though, normality of data is not an issue in SmartPLS (Hair et al., 2017; Ramayah et al., 2018), it is worth to report the normality and distribution of data as a reference for future researchers. In short, all aforementioned assessments and normality test were conducted and reported in the next chapter (Chapter 5).

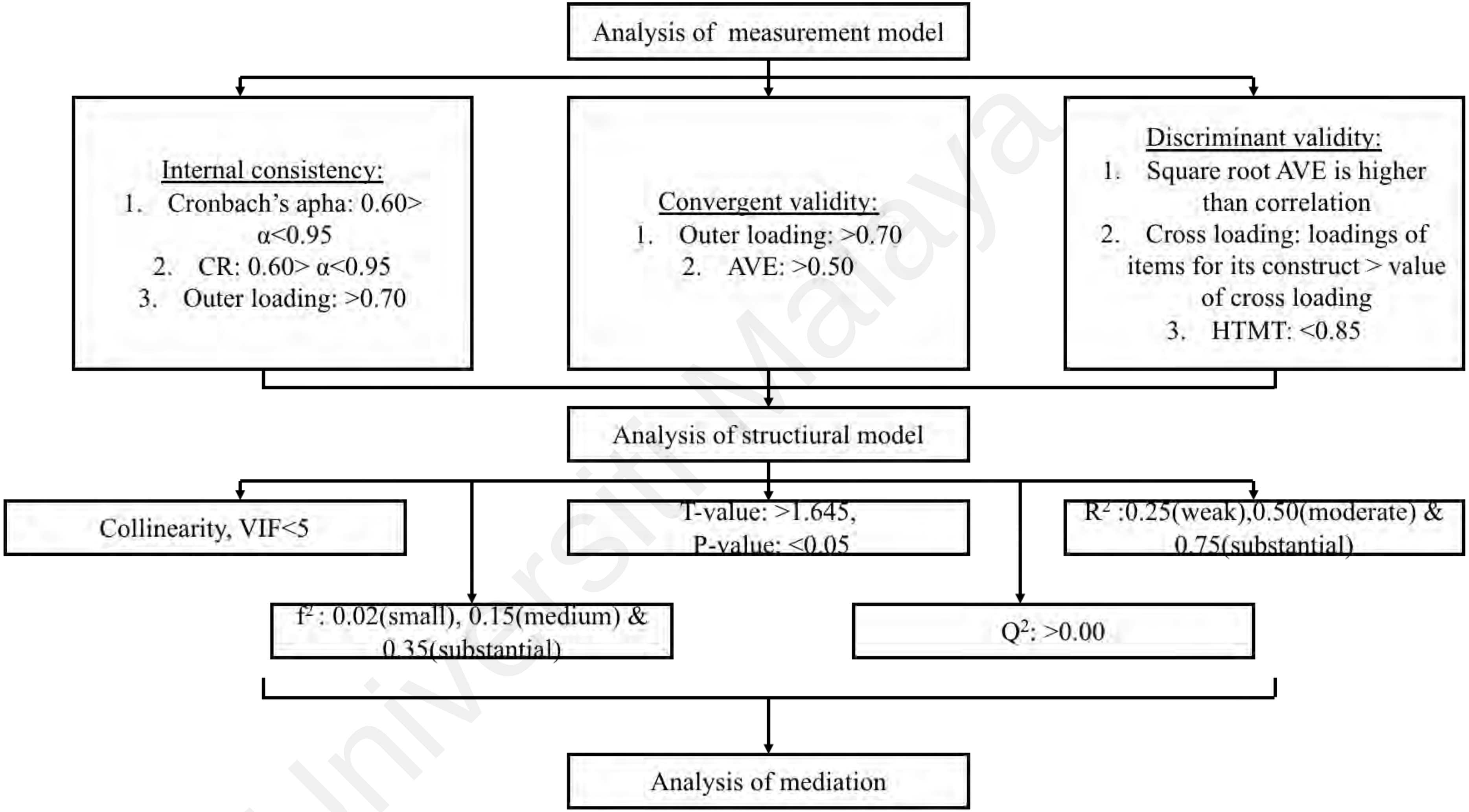


Figure 3.5 The overall process of model development.

C. Determining mediator

On the other hand, the perceived importance of English language proficiency is a mediator for this model. Bryne (2010) mentioned that the mediator or mediating construct is a variable that has two roles in the proposed model: a) as a dependent variable, and b) as an independent variable. In the above diagram, it is apparent that the perceived importance of English language proficiency functions as both dependent and independent variable. It functions as dependent variable in the first equation, where all four exogenous variables are pointing to it. In the second equation, the English language proficiency functions as an independent variable as it contributes to technical communication pedagogical module. Awang (2015) further explains that a mediator can play a role as a: a) complete mediation b) partial mediation, or c) no mediation, in the relationships between exogenous and endogenous variable. For instance, if in this study, the regression equations for Objective construct (X_1), and perceived importance of technical communication pedagogical model (Y), with the mediator perceived importance of English Language Proficiency construct (M) (as presented in Figure 3.7) are:

a) $Y = B_0 + B_1 X_1 + B_2 M + e_1$

b) $Y = B_0 + B_1 X_1 + e_1$

c) $Y = B_0 + B_2 M + e_1$

d) $M = B_0 + B_3 X_1 + e_2$

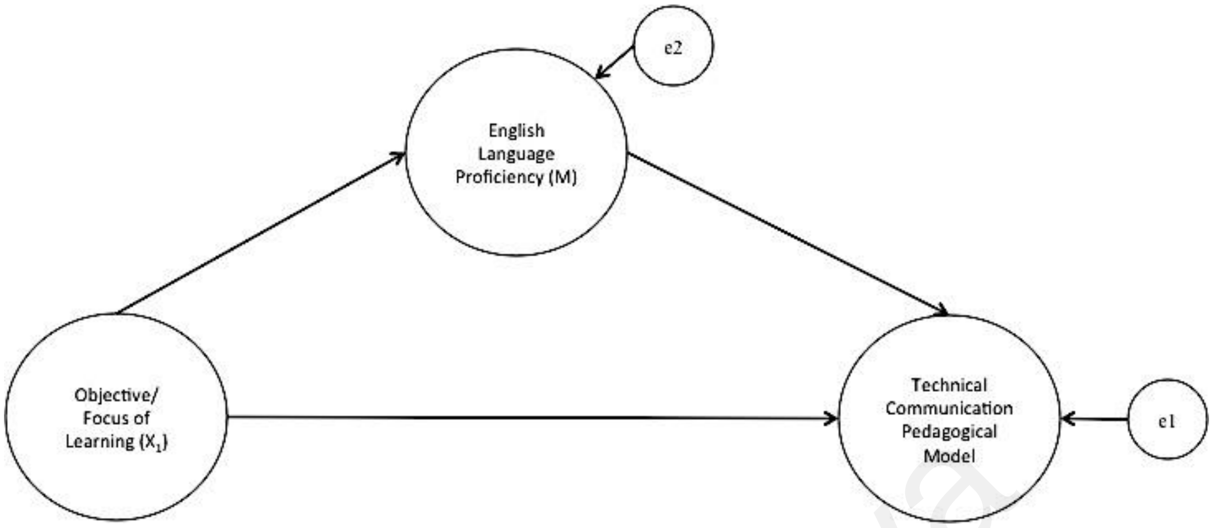


Figure 3.6 The relationships among the variables for Objective/Focus of Learning.

Therefore, in this model, in order to determine the role mediator, the path analysis should be conducted. Based on an example in Awang's (p.37, 2015) work, in the current study, the perceived importance of English Language Proficiency will play the role of complete mediation if only: a) the regression coefficient is not significant for $Y=B_0 + B_1 X_1 + e_1$, b) the regression coefficient is significant for $Y= B_0 + B_2 M + e_1$ and c) the regression coefficient is significant for $Y= B_0 + B_2 M + e_1$.

The perceived importance of English language proficiency plays the role of partial mediation if: a) the regression coefficient is not significant for $Y=B_0 + B_1 X_1 + e_1$, b) the regression coefficient is still significant for $Y= B_0 + B_2 M + e_1$ and c) the regression coefficient is significant for $Y= B_0 + B_2 M + e_1$ and d) the absolute value of the $(Y=B_0 + B_2 M + e_1)$ X $(Y= B_0 + B_2 M + e_1)$ is higher than the absolute value of $Y=B_0 + B_1 X_1 + e_1$.

However, the perceived importance of English language proficiency plays the role of no mediation if one of the criteria is net: a) the regression coefficient is not significant for $Y=B_0 + B_1 X_1 + e_1$, or b) he regression coefficient is not significant for $Y= B_0 + B_2 M + e_1$ and c) the regression coefficient is not significant for $Y= B_0 + B_2$

M + e_1.

On the other hand, Zhao, Lynch and Chen (2010) have simplified this process by providing a summary of how mediation analysis should be done. Figure 3.7 represents the overall process of mediation analysis.

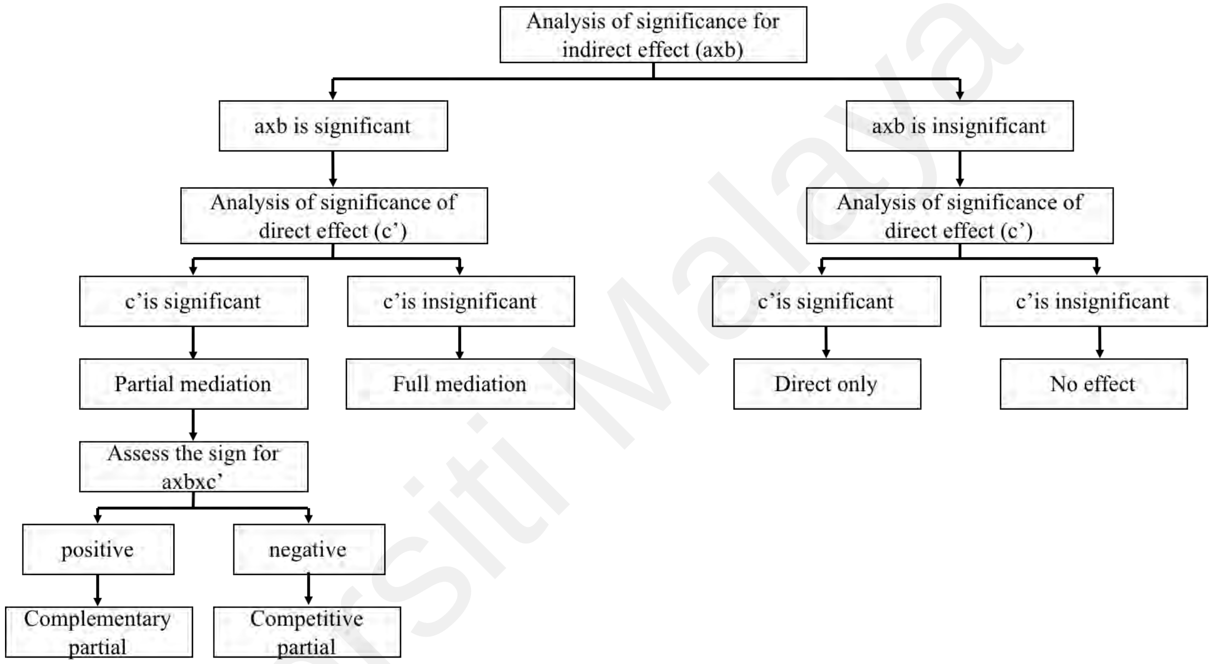


Figure 3.7 Mediation analysis procedure (adapted from Zhao et al., 2010).

According to Zhao et al. (2010), there are two types of partial mediator, which are complementary and competitive. Complementary happens when the direction of indirect (axb) and direct effect (c') is similar (refer Figure 3.8). In this case, the effect of exogenous on endogenous is mediated by a mediator. On the other hand, Ramayah et al. (2018) explain that competitive partial mediation occurs when the direction of indirect (axb) and direct effect (c') is not similar. In both cases, the effect of exogenous on endogenous is still valid without mediator.

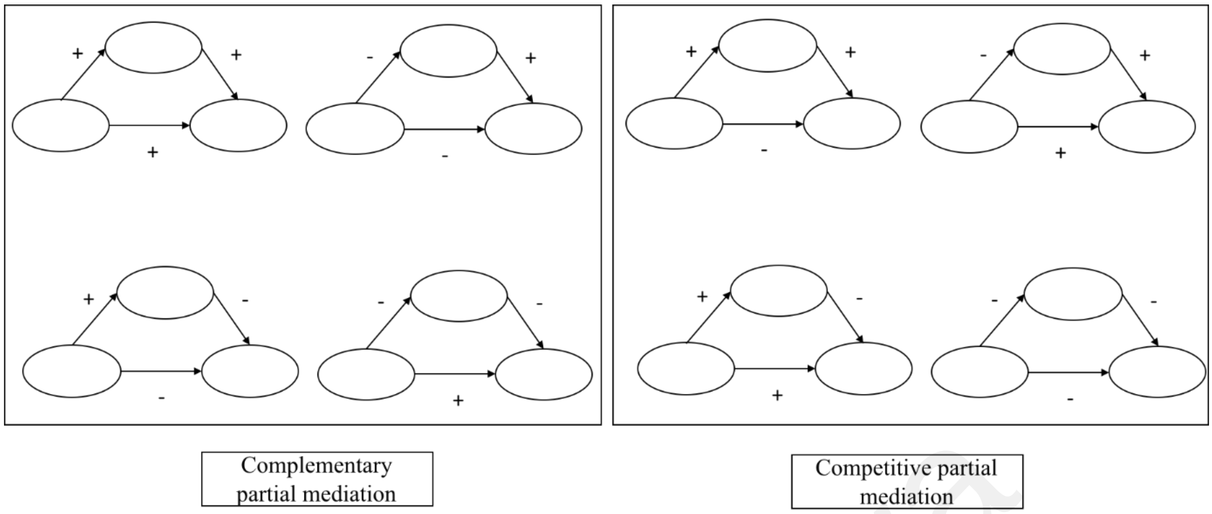


Figure 3.8 Possible patterns for complementary and competitive partial mediation (Ramayah et al., p.211-212, 2018).

Research Participants for Model Development Process

In this study, the target population is English language instructors in Vocational Colleges across Malaysia. According to the current statistic provided by Technical and Vocational Education Division (*Bahagian Pendidikan Teknik dan Vokasional, BPTV*), there are 435 English language instructors across 81 Vocational Colleges in Malaysia (refer Appendix A). For the purpose of data collection, a minimum of 205 English language instructors are selected for this phase. This is consistent with Krejcie and Morgan's (1970) sample size determination for research table. It is stated that for population of 435 (*N*=435), the sample size should be 205 (*S*=205). In addition, Hair et al. (2010) mentioned that the minimum number of participants required sample for SEM should be at least 150 respondents. In selecting 205 instructors, stratified random sampling method is implemented. According to Er (2012), in stratified sampling, the homogenous population is divided into sub populations in order to determine the number of respondents for each stratum. Then, the respondents of this study are randomly selected according to the stratum.

In this study, since the population is 435 English language instructors across 81 Malaysian Vocational Colleges, and the number of English language instructors are varying for each zone in Malaysia, the stratified sampling number is represented in Table 3.1 below:

Table 3.1
The sample size for each region.

Region	**Vocational College**	**Number of instructors**	**Sample size**
Northern	1. Arau Vocational College 2. Kangar Vocational College 3. Kulim Vocational College 4. Pulau Langkawi Vocational College 5. Alor Star Vocational College 6. Sg Petani 1 Vocational College 7. Sg Petani 2 Vocational College 8. Nibong Tebal Vocational College 9. Butterworth Vocational College 10. Batu Lanchang Vocational College 11. Balik Pulau Vocational College 12. Seberang Prai Vocational College 13. Gerik Vocational College 14. Ipoh Vocational College 15. Seri Manjung Vocational College 16. Seri Iskandar Vocational College 17. Slim River Vocational College 18. Taiping Vocational College 19. Kuala Kangsar Vocational College 20. Lebuh Cator Vocational	117	55

	College 21. Kerian Vocational College 22. Teluk Intan Vocational College		
Central	1. Sungai Buloh Vocational College 2. Shah Alam Vocational College 3. Klang Vocational College 4. Kajang Vocational College 5. Kuala Selangor Vocational College 6. Gombak Vocational College 7. Sepang Vocational College 8. Sultan Abdul Samad Vocational College 9. Setapak Vocational College 10. Setapak (ERT) Vocational College	57	27
Southern	1. Melaka Tengah Vocational College 2. Datuk Seri Mohd Zin Vocational College 3. Jasin Vocational College 4. Port Dickson Vocational College 5. Ampangan Vocational College 6. Kuala Klawang Vocational College 7. Juasseh Vocational College 8. Dato' Lela Maharaja Vocational College 9. Dato' Undang Haji Muhamad Sharip Vocational College 10. Batu Pahat Vocational College 11. Segamat Vocational College 12. Kota Tinggi Vocational College 13. Muar Vocational College 14. Kluang Vocational College 15. Tanjung Puteri Vocational 16. College Azizah (ERT) Vocational College	95	45

East Coast	1. Puteri (ERT) Vocational College 2. Tengku Ampuan Afzan Vocational College 3. Sultan Ahmad Shah Vocational College 4. Sultan Haji Ahmad Shah Al Mustain Billah Vocational College 5. Muadzam Shah Vocational College 6. Temerloh Vocational College 7. Kuantan Vocational College 8. Pertanian Chenor Vocational College 9. Kuala Krai Vocational College 10. Pengkalan Chepa Vocational College 11. Pasir Mas Vocational College 12. Tanah Merah Vocational College 13. Bachok Vocational College 14. Pasir Puteh Vocational College 15. Kuala Terengganu (Wakaf Tembusu) Vocational College 16. Kemaman Vocational Coellege 17. Besut Vocational College 18. Dungun Vocational College	91	43
Sabah	1. Kudat Vocational College 2. Keningau Vocational College 3. Labuan Vocational College 4. Sandakan Vocational College 5. Lahad Datu Vocational College 6. Tawau Vocational College 7. Likas Vocational College 1. Beaufort Vocational College	39	18

Sarawak	1. Kuching Vocational College 2. Matang Vocational College 3. Betong Vocational College 4. Sibu Vocational College 5. Bintulu Vocational College 8. Miri Vocational College	36	17
	Total	**435**	**205**

In determining the sample size for each stratum, the total of target sampling (*S*=205) is divided by the total population (*N*=435), and is multiplied by number of instructors for each stratum. For instance, for Northern zone: (205 (total of required sample) / 435 (population)) X 117 (total of instructors in Northern Zone) = 55 instructors to be randomly selected.

The selection of English language instructors is based on two bases: a) theoretical reason, and b) practical reason. From the theoretical perspective, the English language instructors play an important role in translating the aspiration of the curriculum. In the previous chapter (Chapter 1 and 2), it has been established that TVET is a platform to cultivate technical knowledge and skills of the students in order to prepare them for their future (MOEM, 2014; Oxtoby, 1997). Batista et al. (2010) established that pedagogical model represents theories of teaching and learning into an organised and comprehensive guideline for teachers as the implementers in realizing its aims and objectives. In fact, their opinions are very relevant to the development of the pedagogical model. This is supported by Watkins and Mortimore (1999), where there specifically highlighted the importance of teachers' views in pedagogy development.

From the practicality perspective, in Glaser's (1962) instructional model, teacher's views and experiences in teaching are very prominent in evaluating their practices and improvising the quality of learning in a classroom. Therefore, in this study, particularly in this phase (Model Development), English language teachers' views are very prominent to the development of technical communication pedagogical model. Their insights and views on the components of the proposed pedagogical model help to realize the aim of equipping Malaysian Vocational College students with a strong foundation of communication skills for the technical field. In addition, in the current practice, English subjects are being introduced to all students in Malaysian Vocational Colleges. Therefore, the proposed model is believed to be applicable to all technical courses across Vocational Colleges in Malaysia. This is in line with the current practice of these English subjects, which are aimed to develop students who are competent in communicating professional knowledge and conducting working tasks (MOEM, 2014a).

Instruments

The following instruments are used to gather relevant data to the current study:

1. A FDM instrument
2. A survey questionnaire

These two instruments are related to each other. The FDM instrument serves as the basis to determine relevant components of the proposed model for Malaysian Vocational Colleges. The findings of FDM are later used to develop survey questionnaire for SEM.

A FDM instrument. In the needs analysis, FDM instrument is developed based on an extensive review of literature and is used to gather industry and TVET experts' opinions on the prominent elements for the development of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges. Therefore, the instrument in this phase considers all possible elements for all components (objectives, content of learning, method of delivery, assessment method, importance of the model to teaching and learning, and importance of English language proficiency to the model) of the intended technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges.

Previously, it has been established that the development of curriculum concerns on the focus of learning, method of delivery, content of learning and assessment method (Marsh, 2009; Nunan, 2016; Ross 2000; Tyler, 1949). In developing the questionnaire, the questionnaire in Birkholz's (2001) study is found to be relevant as a reference in developing items for content of learning variable. In his study, Birkholz (2001) has modified Fanning and Boyce's (1976) questionnaire in measuring the communication skills needed for the industry. The original questionnaire has 11 categories in representing communication in the working field, ranging from listening, oral presentation, nonverbal, electronic, interpersonal, and small group communication skills, and writing, researching and ICT skills. However, Birkholz (2001) has selected only nine themes from the original questionnaire, which cover oral, nonverbal, written, listening, interpersonal communication, small-group communication, presentations, research, electronic communication, and information technology skills. His questionnaire has been validated by the three General Education department instructors from Wisconsin Indianhead Technical College and two industry practitioners. However, the reliability test of this questionnaire was not conducted and thus, might affect its reliability.

In the current study, only four clusters of skills are presented, which are oral technical communication skills, written technical communication skills, interpersonal communication skills, and researching skills. In the previous chapters (Chapter 1 and

2), it has been established these clusters of skills were the main components of technical communication (Brinkman & van der Geest, 2003; Marshall, 1982).

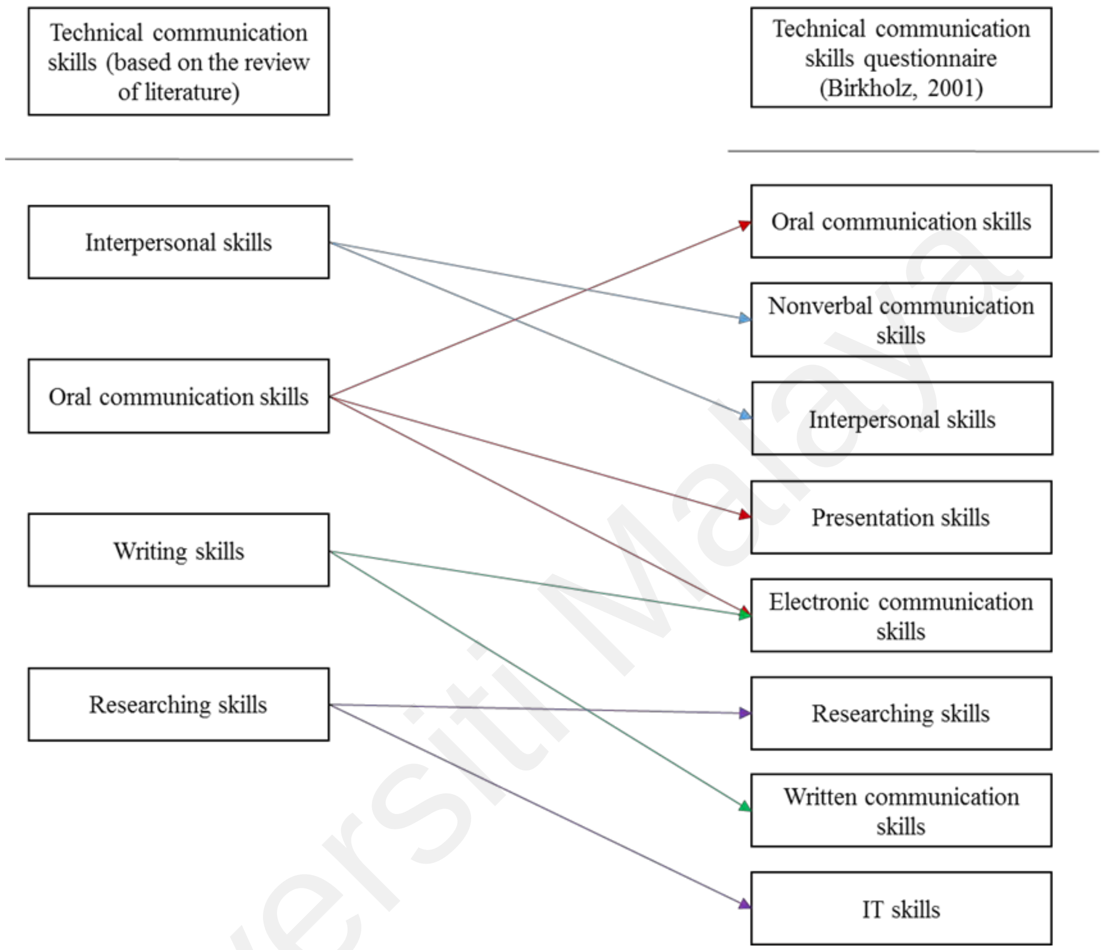


Figure 3.9 The relationship between skills clusters from the review of literature and Birkholz's (2001) questionnaire.

Based on the Figure 3.9 above, the nine skills of technical communication as outlined by Birkholz (2001) can be classified into four clusters of skills. In previous chapter (Chapter1 and 2), it has been established that the technical communication skills can be categorized into four main clusters as above. For instance, McMurrey (2002) and Mitchell (1962) categorized presentations and the use of technology (such as visual, audio and others) under the oral technical communication skills. Also, electronic communication skills is a form of either oral or written communication using electronic medium. In McMurrey's (2002) discussion of technical communication, it has been established that the ability to utilize technological tools for communication as part of oral and written technical communication. Therefore, in the current study, the technical communication skills are categorized into four main clusters as established in the current literature (McMurrey, 2002; Rus, 2014; Tabbron & Yang, 1997).

On the other hand, in oral and written communication skills, Birkholz (2001) only highlighted the basic literacy elements. Arguably, Rus (2014) noted that the general communication scheme is inadequate to represent communication skills required in the technical field. Based on this belief, this current study adapted Cook's (2002) perspective on how the basic literacy should be integrated with a broader spectrum of technical communication literacies. As the result, additional skills were added to the questionnaire. In both oral and written technical communication section, the current study has reviewed the specific texts used in this field. Both McMurrey (2002) and Mitchell (1962) have proposed types of texts and expected competencies to be developed among technical students. Therefore, the section in this questionnaire not only covers basic literacy but also specific texts and relevant competencies to technical field.

In addition, in the interpersonal communication skills, the current study adapted Rus's (2014) idea on the context of technical communication (small group, organizational, and public address), Lappalainen's (2010) emphasis on multicultural awareness element and Brinkman and van der Geest's (2002) feedback competence element to the current questionnaire. Significantly, these elements are deemed to be important, as the works in technical field requires a strong foundation of interpersonal and group skills. Also, in the research skills section, the current study has included relevant skills in Brinkman and van der Geest (2002) and Cook's (2002) framework, such as the ability to retrieve relevant information, ability to gather and organize information, knowledge on how to operate technological tools and use them in communicating effectively in technical field.

On the other hand, for questions on objectives, the questions are developed based on the industry-based curriculum characteristics (Wellington, 1993) and technical communication overall skills development. The questions focus on: a) technical communication skills based on the needs of the industry, b) work-related activities for teaching and learning, and c) framework for teaching and learning.

Next, for method of delivery variable, the questions are developed based on the review of literature, especially current studies that have investigated the teaching of technical communication in TVET institutions (Lappalainen, 2010; 1979; Nutman, 1987; Reaves, 2004). Based on these studies, there are nine methods of delivery applied in teaching technical communication in different TVET institutions. Therefore, the questions for the methods of delivery are developed based on these methods as follow:

a) formal lecture
b) tutorial
c) collaborative learning activities
d) field training
e) team teaching
f) communication modules
g) expert feedback
h) partnership

i) communication across curriculum

Lastly, for questions on assessment method, it is found that five methods were majorly used in the practice of technical communication teaching. These methods include: a) research report, b) oral presentation, c) library-based report, d) written assignments (technical documents) and e) terminology exams.

On the other hand, the instrument also includes additional sections on the perceived importance of technical communication pedagogical model to instructors and students, from the perspective of instructors. This section is developed based on the foundation elements of a sound pedagogy as discussed in Chapter 2 (The pedagogical model and its importance). In the previous section, it has been established that a sound pedagogy must consider both teacher and students' characteristics (Batista et al., 2010; Hallam & Ireson, 1999; Husin & Aziz, 2004) in organizing an effective teaching and learning experiences. Based on this belief, the questions in this section are derived from important elements of teacher and students' characteristics in teaching and learning process. As outlined by Glaser's (1962) teaching model, in realizing the intended learning objectives, teachers must first understand students' entry behaviour, which includes their potential, background knowledge and relevancy of new knowledge to them. In fact, Hallam and Ireson (1999) stated that students and teacher's characteristics will determine the teaching and learning process. This is because, throughout the learning process, students and teacher will reflect on the teaching and learning experiences. As for students, the process of meta-learning will occur as they will link the new knowledge with their existing knowledge of the subject area. Whereas, the meta-teaching or the thinking of teaching, will benefit teacher as it will help the teacher to reflect on the learning experiences and improvise it if needed

(Alias et al., 2014; Ornstein & Hunkins, 2009). Therefore, in the additional section of the questionnaire, questions on the perceived importance of technical communication pedagogical model consider the elements of teacher and students' characteristics. In the first sub section, the questions explore English language instructors' perceptions on the relevancy of the proposed pedagogical to students' prior knowledge and expansion, as well as motivation to learn and develop technical communication skills. On the other hand, the second section explores the instructors' opinions on the relevancy of the proposed pedagogical model from their personal teaching expectations and knowledge of teaching and learning. These questions (from both sub sections) are aimed to gather their valuable perceptions of the relevancy and potential of the technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges.

In addition, the last part, which is the perceived importance of English language highlights the importance English language skills that might be required by students in mastering technical communication skills. Based on the review of literature, it has been established that basic language skills (reading, writing, listening and speaking) are important to help students master communication skills (Dean & Bryson, 1961; Hošková-Mayerová 2014; Klimova, 2014). In fact, in the Communication Process model, Dean and Bryson (1961) has highlighted the importance of "Language System" to effective communication. Without a mastery of these skills, communication will become challenging. In the context of the current study, since the minimum requirement to enter Vocational Colleges for English subject is minimum Band 3 (Technical and Vocational Education Division, 2012), emphasis should be given on English language proficiency. According to a number of studies (Muda, Din, Majid, Ahmad, Shahabudin, Rambely, & Suradi, 2012; Singh, et al., 2014; Zaharim, Ahmad, Yusoff, Omar & Basri, 2012) mastery of basic language skills in English is important to ensure employability of graduates in Malaysian industry. Therefore, in this instrument, the important English language skills are included. Based on the review of OET (2016) and Klimova's (2014) work, the language components are derived to develop items for this survey questionnaire. The items in this section cover: grammar, vocabulary, pronunciation, sentence structure, spelling, non-verbal cues, verbal communication strategy, construction of conversation content, ability to infer information, ability to locate information, ability to comprehend information, and ability to synthesize information.

Once the review of literature is completed and the important components are identified, the proposed items for FDM instrument are presented to seven experts from the panel. In this first phase of FDM, the proposed items are discussed in a greater detail. The experts are given opportunities to add or omit the items based on their knowledge and expertise on the relevant components of the model for Malaysian Vocational Colleges context. Then, the interview with the experts are analyzed thematically. Modification to the initial FDM instrument is made before it is being administered to all 17 experts.

In short, the instrument (for the current study) is divided into four sections: a) demographic data, b) perception on relevant technical communication elements to the industry, c) perceived importance of proposed model, and d) perceived importance of English language proficiency to the model (refer Table 3.2). The instrument uses 5-item Likert scale. Chua (2012) supported that the Likert scale is comprehensible and is more reliable compared to other scales. Generally, this questionnaire consists of general questions in gathering demographic data of the respondents, and questions that are based on the review of the current literature in understanding the important elements of technical communication skills in the localized context of Malaysian industry landscape.

Table 3.2

The summary of items for FDM instrument.

Section	Item	No. of items
A	Demographic Information	4
B	B1: Objective/Focus of Learning	7
	B2: Content of Learning:	
	- B2.1: Oral Technical Communication Skills	10
	- B2.2: Written Technical Communication	10
	Skills	10
	- B2.3: Interpersonal Skills	7
	- B2.4: Researching Skills	
	B3: Method of Delivery	11
	B4: Assessment Method	9
C	C1: Perceived Importance of Technical Communication Pedagogical Model (for instructors)	8
	C2: Perceived Importance of Technical Communication Pedagogical Model (for students)	7
D	Importance of English Language Proficiency to Technical Communication Pedagogical Model	17
	Total	**100**

A survey questionnaire for model development. In earlier section, it has been discussed that a survey questionnaire is used to measure latent variables for this study and later to be modelled the relationships between the constructs (Awang, 2015). For this study, a survey questionnaire is developed based on the findings of FDM. The experts in the needs analysis have first rated the relevant components and subcomponents for the model. Then, calculation of average distance between two fuzzy numbers, group consensus, and and defuzzification value is conducted. The items that have achieved *d* value smaller than 0.2 (d<0.2) and high consensus value (>75%) are considered as relevant components of the proposed model. These items are used to develop the survey questionnaire for model development.

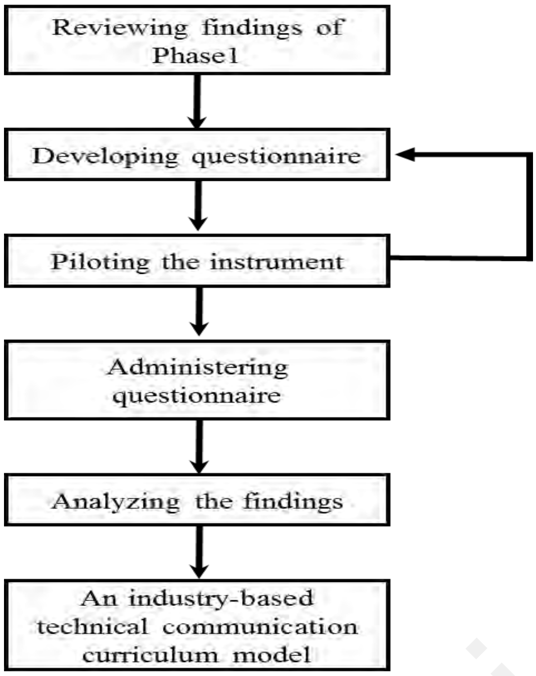


Figure 3.10 The process of developing questionnaire for model development

Chua (2012) noted that the instrument must be first piloted to ensure that it has high reliability value. The Cronbach's Alpha value should be above 0.60 and does not exceed 0.95, in order to achieve reliability of the instrument (Hair et al., 2017). For this study, the calculation of Cronbach's Alpha value is conducted during Exploratory Factor Analysis with pilot data.

Table 3.3

The summary of items for initial survey questionnaire.

Section	Item	No. of items
A	Demographic Information	4
B	B1: Objective/Focus of Learning	7
	B2: Content of Learning:	
	- B2.1: Oral Technical Communication Skills	8

	- B2.2: Written Technical Communication	2
	Skills	8
	- B2.3: Interpersonal Skills	6
	- B2.4: Researching Skills	
	B3: Method of Delivery	8
	B4: Assessment Method	6
C	C1: Perceived Importance of Technical Communication Pedagogical Model (for instructors)	5
	C2: Perceived Importance of Technical Communication Pedagogical Model (for students)	7
D	Importance of English Language Proficiency to Technical Communication Pedagogical Model	4
	Total	**65**

Also, during FDM, the instrument is being validated by the selected experts. The experts have suggested improvisations of items, which include deletion of unnecessary items, restructuring the sentences and wordings, and addition of items that are relevant to the measured variables. This process is called construct validation, that is aimed to ensure the instrument the concept and idea found in the literature are accurately translated into items in the instrument (Drost, 2011).

Hence, the proposed pedagogical model is developed on the findings of the needs analysis. As the result, the questionnaire in this phase is different from the first one (refer Table 3.3 and Appendix E for final instrument, after EFA).

Data Analysis

For this study, the data analysis procedure can be divided according to two phases of the study. In the first phase, in answering research question 1 (What are the key determinants of technical communication skills pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges from industry and TVET experts' perspectives?), a set of questionnaires has been developed with questions covering three main variables (method of delivery, content of learning and assessment method) of technical communication skills. This questionnaire are administered on 17 industry and TVET experts using FDM. The experts' responses (survey questionnaire) are converted to fuzzy scale. The average distance between two fuzzy numbers and group consensus are calculated and the overall value should be smaller than 0.2 (d<.2) (Siraj et al., 2013). Also, the percentage of overall consensus is determined and the value should be above 75%, which indicates a high consensus among experts (Siraj et al., 2013). Later, the defuzzication is conducted in order to change these values to crisp real number and to help rank the items according to the level of agreement.

In the second phase, a modified questionnaire, which is based on the findings of Phase 1 is developed and administered on 205 TVET instructors. In answering the second research question (What are the pertinent elements of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges according to English language vocational college instructors?) the inferential statistics are used to determine the relationships between variables (method of delivery, content of learning and assessment method) using regression analysis, and the level of effect size and predictive ability of all components of curriculum to predict an industry-based technical communication skills pedagogical model is calculated. Table 3.4 summarizes the research questions, instrument, participants and data analysis procedure for the current study.

Table 3.4

The summary of data analysis procedure.

Phase	Research question	Instrument	Participants	Data analysis procedure
1	What are the key determinants of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges from industry and TVET experts' perspectives? What is the: a) prominent objective b) prominent content of learning c) prominent method of delivery d) prominent assessment method e) English language proficiency skills f) perceived importance of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?	FDM instrument	17 industry and TVET experts.	FDM: Calculation of d value Percentage of agreement defuzzication
2	What are the pertinent elements of an industry-based technical communication skills pedagogical model for Malaysian Vocational Colleges according to English language vocational college instructors? • What is the effect of the prominent:	Questionnaire	205 TVET instructors	<u>Measurement model:</u> <u>Reliability:</u> Cronbach Alpha's, CR and outer loading <u>Convergent validity:</u> AVE and outer loading Discriminant validity: squared AVE, cross loading and HTMT

	a) objective b) content of learning c) method of delivery d) assessment method on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges? • What is the level of coefficient of determination, effect size and predictive ability of all pertinent curriculum components to predict technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?		<u>Structural model:</u> VIF T and P-value R^2 value Effect size (f^2) Predictive relevance (Q^2)
3	What is the effect of perceived importance of English language proficiency on the relationships of all pertinent curriculum components to predict technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?		Mediation analysis: P-value for direct and indirect effect

Exploratory Factor Analysis (EFA) in Pilot Study

Exploratory factor analysis (EFA) is a statistical tool used for exploring psychometric properties of an instrument (Osborne, 2014). According to Osborne (2014), EFA is used to: a) examine all pairwise relationships of individual variables, and b) extract latent factors of the measured variables. Williams, Brown and Onsman (2010) supported that EFA is helpful in reducing the large number of variables, establishing the underlying dimensions, and providing evidences for construct validity. Williams et al. (2010) further explained that in conducting EFA, there are five major steps to guide this process. The steps are illustrated in Figure 3.11 below.

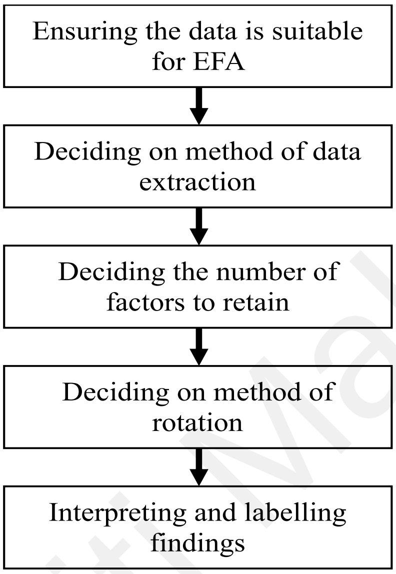


Figure 3.11 Steps to conduct EFA as outlined by Williams et al. (2010).

Williams, et al. (2010) noted that, before conducting EFA, the first step is to ensure that the data is suitable for this process. This process is also known as factorability (Worthington & Whittaker, 2006). In achieving this, the sample size must first be adequate. Williams et al. (2010) argued that there is no exact value in determining sample size for EFA. Nevertheless, Hair, Anderson, Tatham & Black (1995) suggested that the minimum number of sample should be 100. Another way of determining the sampling size is to follow the *N:p* (where *N* is the number of participants and *p* is the number of variables) ratio. The ratio can either be 3:1, 6:1, 10:1, 15:1 or as big as 20:1 (Gorsuch, 1983; Pett, Lackey & Sullivan, 2003; Tabachnick & Fidell, 2007). For the current study, there were 100 English language instructors selected for this phase. This is in line with Hair et al.'s (1995) minimum sampling size suggestion. In fact, the sampling size is also in line with the 10:1 ratio, as there were initially ten variables derived from an extensive review of literature and findings from FDM.

In addition, Osborne (2014) noted that data cleaning should also be conducted prior to EFA. He mentioned that the missing data should be identified and appropriate treatment should be applied. He believes that if an error is not being addressed properly, the analysis of EFA will be affected. For the current study, the process of eliminating input errors was conducted to ensure that the data was entered with no error. Then, the issue of non-response was addressed using expectation maximization approach (Bryne, 2010). Once the data cleaning is completed, a preliminary interpretation of factorability of EFA can be conducted. There is a number of ways to conduct this process. First is by identifying items with correlation value lower than 0.3 and higher than 0.9 based on the correlation matrix table should be conducted (Yong & Pearce, 2013). Items that achieved lower (<0.3) and higher correlation value (>0.9) should be removed as they have very weak correlation to describe a factor (items with correlation value <0.3) or high multicollinearity (items with correlation value >0.9). In addition, Williams, et al. (2010) suggested that the use of Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett’s Tests of Sphericity to ensure that the data is suitable for EFA. The value of KMO Measure of Sampling Adequacy should be at least 0.50, as this test measures the partial correlation relationships to the overall value of squared correlation (Worthington & Whittaker, 2006). On top of that, the Bartlett’s Tests of Sphericity should be significant, $p<0.05$ (Williams, et al., 2010). This test is used to estimate probability of correlations are 0 in a matrix (Worthington & Whittaker, 2006).

The next step is to decide on method of data extraction. Osborne (2014) described that extraction is a dimension reduction process of the studied variables. In SPSS, there are a number of extraction methods available, such as unweighted least square, generalized least square, alpha factoring, image factoring, principal axis factoring, principal component analysis and maximum likelihood (Bryman & Cramer, 2011; Osborne, 2014; Williams, et al., 2010).

Typically, principal axis factoring and principal component analysis are used as the method of extraction (Bryman & Cramer, 2011; Williams, et al., 2010). According to Bryman and Cramer (2011), principal component analysis analyses all the variances (common, specific, error and unique). Hence, they believed that this method is effective to be used as it assess the variables without error. On the other hand, principal axis factoring only analyses the common variance and excluding the unique variance. However, for this study, principal axis factoring was selected. This is because the purpose of EFA in this study is to explore and understand the factors or constructs as they account for the shared variance of items (Worthington & Whittaker, 2006). As supported by Worthington and Whittaker (2006), this method (which is under Factor Analysis) is more appropriate and aligned to researcher's objective in developing new scales. In this study, it has been deliberately discussed that there were very limited and to my knowledge, no specific and priori model or theory that reflect the aims of the current study (to develop technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges). In addition, Osborne (2014) cautiously warn that principal component analysis is often misunderstood and used inaccurately for analysis. This is because it is a default extraction method in a number of statistical software. Osborne (2014) added that in some cases, the principal component analysis is interchangeably used with EFA, and sometimes is used to run an analysis that is more relevant for EFA. Hence, Osborne (2014) noted that the selection of this extraction method should be cautiously done and used for analysis.

In the next step, it is important to decide on the number of factors to retain for EFA. There are a number of ways to determine this: a) based on relevant theory, b) Kaiser's criterion (Kaiser, 1958), and c) Cattell's (1966) Scree Test (Osborne, 2014; Williams et el., 2010). Osborne (2014) noted that if the instrument has been previously developed by previous researchers, and reflects relevant theories, the number of factors can be derived from these theories and findings. On the other hand, the Kaiser's criterion and Scree Test (Bryman & Cramer, 2011; Williams, et al., 2010) can be used to help determine the number of factors for EFA. According to Bryman and Cramer (2011), in Kaiser's criterion approach, factors that have an eigenvalue greater than one will be selected and accounted. Williams, et al. (2010) added that the cumulative percentage of variance and eigenvalue (larger than 1) rule can be used to help determine the number of factors to be retained. They quoted Hair et al.'s (1995) suggestion where the determination of number of factors should stop when 50% to 60% of the variance is explained. Lastly, the Scree Test is another possible method to help determine the number of factors to be retained. Bryman and Cramer (2011) described that the result of Scree Test provides a clear illustration of factors that have been extracted. The number of factors is then determined based on the interconnected point between steep slope of the initial factor and a point above the debris (Bryman &Cramer 2011; Williams, et al., 2010). For the current study, the aforementioned approaches were used to determine the number of factors to be retained.

In the next step, it is important to decide the method of rotation. Osborne (2014) described that method of rotation is beneficial to help ease interpretation of

EFA results. There two types of rotations: a) orthogonal and b) oblique rotation. In orthogonal rotation, the results will show factors that are not correlated, whereas in oblique rotation, the factors are deemed to be correlated with each other (Bryman & Cramer 2011; Osborne, 2014; William et al., 2010). For orthogonal rotation, the researcher can either choose varimax, quartimax, or equimax rotation. Osborne (2014) described that in varimax rotation, the loadings will be increased (both high and low loadings), and this will help to maximize the variance of a factor. On the other hand, quartimax and equimax are primarily used in clarifying the loadings. For oblique rotation, there are two types of rotation methods: a) promax, and b) direct oblimin. According to Osborne (2014), promax is used in clarifying the loadings pattern. The direct oblimin also helps to provide almost identical results to promax. However, Osborne (2014) stated that this method is sometimes problematic. For the current study, oblique rotation method using promax has been selected. As discussed by Worthington and Whittaker (2006), the criteria of selection must reflect the theory or data at the initial phase of EFA. The selection was based on theoretical framing of the study, where in Tyler's (1949) curriculum planning model, the components of curriculum (objective, content of learning, method of delivery and assessment method) are interrelated with one another. Hence, the items used in the current instrument were correlated and thus, oblique rotation was a suitable rotation method for the EFA.

Finally, once the process of determining factors for extraction and rotation method is completed, the results need to be interpreted. Yong and Pearce (2013) noted that this process involves interpretation of factor loadings, and item to factor attributes. It is noted that, there is a possibility for cross loading to occur in an analysis. As described by Yong and Pearce (2013), an item that is loading on two or more factors, with factor loading of 0.32 or higher on these factors, is considered as a cross loading.

In dealing with this item, it is suggested to omit the item if it complicates the interpretation. However, Yong and Pearce (2013) noted that this item should be retained if it reflects the nature of the variable. On the other hand, Worthington and Whittaker (2006) suggested additional criteria to item deletion. The researcher might need to carefully identify the factor loading of cross-loading items on two or more factors. If these items have cross-loading value less than 0.15 to highest loading value, then these items should be omitted. Also, for cross-loading items that load more than 0.32 value on two more factors, these items should be omitted. Once the researcher is satisfied with the findings, the next step is to name and label the factors according to their shared characteristics or themes (Williams et al., 2012). The findings of the pilot study is presented in Chapter 5.

Conclusion

In short, this study employs the FDM and survey design with PLS-SEM analysis. Also, after the results of FDM have been established, an EFA is conducted in order to validate and explore the dimensions of the proposed variables in the questionnaire. The results of EFA (reported in Chapter 5) provides valuable information, especially on possible content of learning that focuses on the development of social literacy and oral presentation skills. The next step (after pilot study) is to administered the questionnaire on 205 English language instructors in Malaysian Vocational Colleges across Malaysia. Lastly, the analysis is conducted using SmartPLS to develop the model.

CHAPTER 4

FINDINGS OF THE NEEDS ANALYSIS PHASE

Introduction

This chapter provides a detailed report of Phase 1 (Needs Analysis) findings. As discussed earlier (in Chapter 3, Research Design), the Needs Analysis phase is aimed to gather experts' professional opinions on the key determinants of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges, in answering the first research question: What are the key determinants of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges from industry and TVET experts' perspectives? According to Ellis and Levy (2010), in building the foundation of a model or framework, a critical review of literature and experts' professional opinions are very prominent.

In achieving this, Fuzzy Delphi Method was implemented in the current study. Through this method, the process started with a critical review of literature and was followed by interview with five experts (academic and industry experts), and finally, a Fuzzy Delphi instrument was administered to all 17 selected experts. The overall findings of this phase cover all four components of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges: a) Objective, b) Content of Learning, c) Method of Delivery, and d) Assessment Method. In addition, findings for the importance of the proposed model (for teachers and students) and English language proficiency to technical communication, are also presented in this chapter.

Demographic Information of Selected Experts.

The demographics of the selected respondents from industry and academic instructions are collected through the Fuzzy Delphi instrument (Section A: Demographic Information). 17 experts were identified and selected in this phase. The selected experts were first identified and categorized into two groups: a) TVET experts, and b) industry experts. From this number, five experts were selected for the initial stage – development of Fuzzy Delphi instrument (FDI). Then, all 17 experts answered the Fuzzy Delphi instrument. In the previous chapter (Chapter 3, Research Participants), it has been stated that the TVET experts must have master's degree or doctoral degree in TVET; have more than five years of experience in TVET; and have experiences in fieldwork training. On the other hand, the industry experts for this study were selected as they: have at least a diploma/Malaysian Skills Certificate Level 4 or degree in their respective fields and are involved in industrial training. A total of 17 experts, consist of seven TVET experts and ten industry experts were selected in this study. Table 4.1 shows the distribution of experts according to working experiences.

Table 4.1

Distribution of experts according to working experiences

Working experience (years)	Frequency	Percentage
Less than 10 years	6	35.3
11 – 20 years	4	23.5
21 – 30 years	3	17.6
31 years and above	4	23.5
Total	**17**	**100**

Out of 17 experts, six experts (35.3%) have working experience less than ten years. These experts have been working at least six years in their respective fields. Four experts (23.5%) have working experience between 11-20 years, three experts

(17.6%) have working experience between 21-30 years, and four experts (23.5%) have working experience more than 31 years.

Table 4.2 represents the distribution of experts according to their area of expertise.

Table 4.2

Distribution of experts according to their area of expertise.

Area of Expertise	**Frequency**	**Percentage**
TVET	6	35.3
TESL in TVET institution	1	5.9
Healthcare	1	5.9
Manufacturing	1	5.9
Business Management	1	5.9
Electrical	1	5.9
Architecture	1	5.9
Building Construction	1	5.9
Hospitality (Tourism, Hotel Management, and Culinary)	3	17.6
Total	**17**	**100**

Based on the above table, six (35.3%) experts are from TVET area and one TVET expert (5.9%) is specializing in TESL (Teaching English as a Second Language) in a TVET institution. Three experts (17.6%) are from hospitality sector, which includes Tourism, Hotel Management (Food and Beverage section) and Culinary. One expert (5.9%) is from Healthcare, Manufacturing, Business Management, Architecture, and Building Construction sector.

Table 4.3 shows the distribution of experts by level of education.

Table 4.3

Distribution of experts by level of education.

Level of Education	Frequency	Percentage
Diploma / Malaysian Skills Certificate Level 4	2	11.8
Degree	7	41.2
Master's Degree	2	11.8
Doctoral Degree	6	35.3
Total	**17**	**100**

A majority of experts (seven experts, 41.2%) have degree qualification. Six experts (35.3%) have doctoral degree, two experts (11.8%) have master's degree and two experts (11.8%) have diploma or Malaysian Skills Certificate Level 4.

Table 4.4 shows the distribution of experts by employment status.

Table 4.4

Distribution of experts by employment status

Employment Status	Frequency	Percentage
Academic Professional	7	41.2
Non-Academic Professional	7	41.2
Technical	3	17.6
Total	**17**	**100**

Out of 17 experts, seven experts (41.2%) are academic professionals, another seven experts (41.2%) are non-academic professionals and three experts (17.6%) are from technical field.

Conducting Fuzzy Delphi method in the Current Study

As discussed earlier (Chapter 3), FDM is a relevant method to gather experts' consensus on the relevant elements for the development of technical communication pedagogical model. In the current study, two stages of FDM are conducted: instrument development through interview with experts, and administration of the revised instrument. In the first stage (instrument development), five experts are selected and interviewed. These five experts are from industry, TVET institution and Technical and Vocational Education Division (*Bahagian Pendidikan Teknik dan Vokasional, BPTV*) as illustrated in Table 4.5 below.

Table 4.5

Experts for fuzzy delphi instrument development.

Expert	Qualification	Area of Expertise
1	Master's Degree	Industrial training
2	Doctoral Degree	Education and training / technical and further education
3	Doctoral Degree	Education and training / technical and further education
4	Doctoral Degree	Education and training / English language
5	Master's Degree	Technical and Vocational Education Division

A semi-structured interview was conducted with each expert and the questions cover all components for the development of technical communication pedagogical model. The findings of the interview were transcribed and analyzed thematically.

Findings from the semi-structured interviews. Based on the responses of the semi-structured interviews, experts' opinions and suggestions are themed according to six themes according to components of the model:

a. Objective,
b. Content of Learning (oral technical communication, written technical communication, interpersonal and researching skills),
c. Method of Delivery,
d. Assessment Method,

e. Perceived Importance of Technical Communication Pedagogical Model (Students and Teachers),

f. Perceived Importance of English Language Proficiency to Technical Communication Pedagogical Model, and

Objective. For objective, the experts agreed that teaching and learning should be contextual and reflecting the actual communication skills applied in the industry. For instance, one of the experts questioned the current practices in Malaysian TVET in developing technical communication skills:

> "*Is there any like a specific communication skill that are relevant to the industry? Is there certain style of communication that are relevant to the industry?"* (AC1)

Similarly, another expert expressed that the current teaching and learning practices is not contextual.

> *"The communication skills being developed at institution level is not contextual."* (AC2)

This leads to a conclusion that, the objective/focus of technical communication pedagogical model is to develop communication skills that are relevant to the industry. This is further supported by another expert as he stated that oral communication skills are important in real industry settings:

"We need the element of oral communication because every department in the industry needs effective communication. If not the (working) system will be affected." (IE1)

In addition, developing technical writing skills should be one of the focuses of the proposed model.

> *"Yes, and it depends on the post of the workers or students. So, for example, degree, for degree students (graduates with degree) they need to write reports for the department and for diploma (graduates) and Vocational College (graduates) they need it (too)." (IE1)*

This shows that technical writing is important in real working settings.

The experts also agreed that the objective should aim to develop interpersonal skills that are relevant to the industry. One of the experts mentioned that:

> *"In an organization, there is a lot of conflicts and miscommunication, so they (students) need to learn how to become a good worker… interpersonal is very important (as) they need to communicate with co-workers and understand instructions from supervisor, if not the (working) system will be affected." (IE1)*

On the other hand, researching skills should be the focus in the proposed model. One of the experts (from industry) highlighted the importance of this skill in industry settings:

> *"Yes, but research in the context of Vocational College (is) not too academic like what universities do. (They) need to do problem solving and to do some studies and research. For example, to find evidences to problems in handling machines; they must learn techniques [to], what we call as industrial forensics. With that researching element, they can help reduce defects of the products (in the production)." (IE1)*

In short, the experts agreed with the suggested objectives that are derived from the review of literature. The experts emphasized that the teaching and learning activities should be contextualized – reflecting the communication skills that are applied in real working settings.

Content of learning. Based on the interview, the experts generally agreed with almost all sub skills of technical communication.

a. Oral technical communication skills

For oral technical communication, the experts agreed that the ability to find a situation that suits an oral presentation is important to be emphasized in the content of learning. For instance, the experts mentioned that:

> *"Definitely, they (students) need to find situation that is appropriate, that has similarities with industrial situation." (AC2)*

> *"They (students) need to know how to present, the content of presentation and need to know the standard presentation duration and need to know how to cope with questions and answers… Even if you want to present to your boss, you still need this skill. In the industry, these are the skills that we emphasize and do" (IE1)*

For the ability to define audience for communication, the experts justified that knowing and understanding who the audience and their background are very important.

> *"In real industry settings, there is hierarchy. So, need to know (who are your audience) and address them appropriately in discussion." (IE2)*

> *"…the ability to define audience... that's, knowing audience is very important." (AC1)*

This is because the speaker will be able to design and deliver the content of communication to suit listeners' background and this will help to enhance their understanding.

Other than that, the experts agreed that the ability to research on a topic for oral communication is important to be emphasized.

> *"The ability to research on a topic is important to be emphasized in the content of learning. Is it different, (different to) certain level occupation of the (worker), let say a technician, they are lower level, I don't think they need to do that kind of research (kind of) thing, maybe at higher (level), it depends on the context as well." (AC1)*

In fact, an expert from industry highlighted the importance of this skill for an effective communication in real industry settings.

> *"The content must be job specific and the functions, at least they (audience) can relate (to) the topic." (IE1)*

On the other hand, the ability to plan and prepare visual aids is suitable for larger audience. One of the experts stated that:

> *"The ability to plan and prepare visual aids is important to be emphasized in the content of learning. It is like for more people… I mean more suitable when you are facing the larger audience, rather than…one-to-one, don't need." (AC1)*

The use of visual aids is suitable for communication to larger audience.

On the other hand, the ability to plan an introduction and conclusion of oral presentations is important to be emphasized in the content of learning. One of the experts justified that:

> *"…they need to differentiate between a speech or talk with presentation… sometimes people (in the industry) give long talk/speech, (whereas) he/she supposed to deliver presentation only… sometimes the introduction is longer than content and there is no solution. So, we need to know it (ability to plan introduction and conclusion)." (IE1)*

This skill is important as it will help students to understand the importance of structuring the introduction and conclusion of an oral presentation in order to reemphasize and summarize the important points.

The experts also agreed that the ability to chair a meeting is important to be emphasized in the content of learning.

> *"Yes. Or at least (they) know how to prepare a document; filing system and how to write minute… It's very important because all workers don't know how to do (and thus) there (will be) no progression in the organization." (IE1)*

> *"Yes, to chair a meeting depends on position held. But in a group working with assistants or co-workers], yes they need this skill." (TE1)*

They also agreed that the ability to present in a conference is important to be emphasized in the content of learning. This skill is important in the working field because in certain situations, depending on the company, the workers have to present their work to larger group. For instance, one of the experts (from industry) mentioned that:

> *"Yes, they have to present in group in real working environment so this skill is [helpful so that they will be more skillful (in presentation)]." (TE1)*

However, based on the interview, some of the experts disagreed with the importance of developing ability to deliver a speech to audience. This is because, for most workers, they do not deliver speech. One of the experts explain that:

> *"Not important. Okay for them to know importance of it… because we the downline workers, most of us don't see speech but listening is important." (IE1)*

In short, the experts suggested that the subskills of oral technical communication are important and most importantly the ability to understand the audience. As mentioned by one of the experts:

"Maybe you have to think that… what would be important especially when you are dealing (with) one-to-one communication, and when you are dealing with communication, let say I communicate with (my) team members same level and also at the higher hierarchy. So, this kind of communication that you need. Because the way you talk to your… you know… somebody… the communication, the oral communication... let say you are talking to somebody from lower level, so you might not, you know, use the... you know use easier vocabulary, the easier kind, more commonly used technical words." (AC1)

b. <u>Written technical communication skills</u>

Generally, the experts agreed on all subskills of written technical communication skills presented in the literature. For the ability to produce business letters, the experts agreed that this skill should be emphasized in the content of learning. For instance, the experts mentioned that:

"Yes, very needed." (TE1)

"I agree... and for industry they don't really use paper-based letters but more to how to write effective emails… it's not too formal (not follow strict formats/protocols), for example (you start with) greetings, and straight to content and thank you. And these emails need to have system like they need to know who is the target audience of the email and (are in) the mailing list." (IE1)

Based on the interview, the experts agreed that the ability to produce user guides document is important to be emphasized in the content of learning. The experts explained that:

"Yes, but to write this, we need specific worker to do, maybe for degree (graduates) need to do this." (IE1)

"Yes, correct. But they really need to understand the product and steps (to use) and functions, and how to write clear instructions (for users)." (TE1)

"Yes, for example manual. Used widely in industry. You have to have manual first." (IE2)

For the ability to produce online helps document, the experts agreed that it is important to be emphasized in the content of learning. One of the experts specified that the online platform is used widely by consumers and industry, as he stated that:

"Okay… online (platform) is faster and widely used." (IE1)

Similarly, the ability to produce technical-support document is also important to be emphasized in the content of learning. The experts expressed that:

"Yes. Each product must have this and they need to understand first." (TE1)

"Important." (IE1)

One of the experts mentioned that technical support for workers also being used in real industry settings as a reference of operating procedure.

"Yes. For an example, SOP (standard operating procedure) with flowchart is usually used." (IE2)

Also, experts agreed that the ability to produce reference information document is important to be emphasized in the content of learning. One of the experts (from industry) highlighted the importance of developing this ability, especially in its production or what he referred as the product life cycle.

> *"Yes… need to know the life cycle of a product; what material, which process and what will happen and how about the waste if it's being disposed…" (IE1)*

Similarly, another expert also agreed with this:

> *"Yes. From the product (that they produced), they need to really understand first (before) they can do this." (TE1)*

The experts similarly agreed on the importance of developing students' ability in producing research report, consultant technical document, and technical journalism. For research report, this skill is important especially for students who are serving in research and development (R&D) department and top management. One of the experts mentioned that:

> *"Yes. For top management and R&D department must know, but for production or processing maybe just give them exposure." (IE1)*

In relation to the ability of producing research report, the experts agreed that consultant technical document is also important in working field. One of experts explained that:

> *"Agree. Plus, they need to know the life cycle of a product, to consult. That is why they need to know the research report (as well), this skill has a relation to research report." (IE1)*

This is the similar case for the ability to produce technical journalism. For instance, the experts explained that:

> *"I agree because the industry at the moment is disengage with universities. Because of this, university experts know how to write journals but not aligned with the industry's style of writing. Need to give them (students) exposure to what words/vocabulary largely used so that will understand what and how to read the journals." (IE1)*

In fact, the academic expert suggested this skill is important to be integrated in the current curriculum of Malaysian vocational colleges.

> *"Yes. This should be suggested in the curriculum, KSKV." (TE1)*

In addition, the experts suggested additional focus, which is the ability to produce marketing literature in the content of learning. From the perspective of industry expert, marketing literature, especially through online social media, is important because consumers nowadays are inclined to use this platform. He explained that:

> *"Ok. I think this is priority. People already started using Facebook, online marketing… (students) must also know application copyright, company's copyright and … how to deal with payment." (IE1)*

The expert from TVET field also agreed with this suggestion. He further explained that the current curriculum has not emphasized on developing this ability.

> *"Yes. Marketing literature is not being exposed in Vocational Colleges curriculum. So, there is a need to focus on this. This need to be integrated in the curriculum in order to enhance the current KSKV (Standard Curriculum for Vocational College), so that these skills could be developed." (TE1)*

In addition, another industry expert mentioned that this ability is important for an effective advertisement and promotional purposes in industry settings.

> *"Agree. Especially for advertisement and promotion proposes if you want to sell a product. (In fact), before the product (production) must have this (marketing literature). Usually, [the best] market study is three years before launching." (IE2)*

In short, the experts agreed that developing students' written technical communication skills are important. As mentioned by one of the experts:

> *"...the elements (in the technical writing skills) are very important. I agree with all of the items." (IE1)*

In fact, in the higher education level, some of these skills are being highlighted as important foundation for effective communication skills for work.

> *"That is common in (any) MTUNs, Universities and Polytechnics." (AC2)*

Therefore, it is relevant to expose these skills as early as secondary education levels in Malaysian vocational colleges.

c. Interpersonal skills

Based on the interview, the experts agreed that the subskills for interpersonal skills are important to be developed as the content of learning for students in Malaysian Vocational Colleges.

The ability to communicate effectively with co-workers and administrators is viewed important to be emphasized in the content of learning. The experts mentioned that:

> *"...because they deal with projects and group work." (AC2)*

"Yes, they need to know how to communicate." (IE1)

In fact, in the current curriculum for Malaysian vocational colleges, this skill has been exposed to students, as described by one of the experts.

"Yes, this is important and is being practiced (in the current curriculum)." (TE1)

d. <u>Researching skills</u>

Based on the interview, the experts agreed that the subskills for researching skills are important to be developed as the content of learning for students in Malaysian vocational colleges.

As mentioned by one of the experts from the industry, retrieve reliable sources of information is important:

> *"Yes, and (for) the information they need to know which one is reliable." (IE1)*

In addition, the skills in gathering and organizing the resources are important especially in producing documents related to work. For instance, one of the experts mentioned that:

"Yes, if you want to write a manual that's the skill you need." (IE1)

The importance of developing skills to comprehend job-related journals and technical materials is also being highlighted by the experts. Specifically, one of the experts from industry mentioned that this ability to comprehend and interpret visuals, such as figures, charts and graphs is very important in industry:

> *"Visual interpretation? Yes, data in visual forms (are) very important. For example, interpretations of graphs. In industry settings, when you want to present, the boss will look at your datasheet, charts, (where) you plot six months, a year, or monthly outcomes." (IE2)*

Similarly, the experts mentioned that ability to distinguish main ideas from supporting details is important to emphasized in the content of learning:

"Yes. Even in primary and secondary school this skill has been emphasized." (AC1)

"Yes, how to find keywords and present to the boss. If not it will be lengthy." (IE1)

Other than that, in equipping students with researching skills, the content of learning should be focusing on developing knowledge on how to operate technological tools to improve communication. This is because, one of experts stated that through implementation of technological tools in work, jobs can be completed faster.

"Yes, can make every job done faster." (IE2)

Methods of delivery. The experts agreed that formal lecture, practical tutorial, teaching partnership, team teaching, communication module, expert feedback, and communication across curriculum are important method of delivery to develop technical communication skills among students in Malaysian Vocation Colleges.

The formal lecture is found important for introductory lessons, as one of the experts mentioned that:

"Formal lecture is one of them (delivery methods), but formal lecture just for starting (introductory lessons) only." (AC2)

Practical tutorial is also an important method of delivery. However, according to the one of the experts, it should not be focusing on providing too much hands-on activities because this is to develop theoretical knowledge.

"Yes, but not as much as hands-on activities." (IE1)

Furthermore, the experts agreed that teaching partnership, which involves partnership between instructors from language and technical department, is important method of delivery for technical communication skills development. For instance, the experts mentioned that:

> *"Yes, and [need to have] mentors from industry to be consultants or the lecturers (with) ten years of experience in the industry." (IE1)*
>
> *"Yes. The content must be related to their (students') course." (TE1)*

In addition, team teaching, which refers to teaching collaboration between technical and English language instructors during a lesson, is viewed important among experts. One of the experts explained that:

> *"This is good as you mentioned, now it is not happening… not at all. It is one of strategies so that English teachers know the working environment. And then, they could understand content and [they could] advise." (AC2)*

Furthermore, for communication module, the experts agreed that it is important to be considered in Malaysian Vocational Colleges. In fact, one of the experts suggested the content of the module should not be presented as tutorial based and not too exam-oriented.

> *"Yes. But must be in tutorial based not too exam oriented." (IE1)*

Other than that, the experts also appointed that expert feedback from technical field on the content and task for learning is a relevant method of delivery to develop students' technical communication skills. This is because the industry experts or employers are involved in the teaching and learning process and their opinions will help to enhance students' mastery. This is being appointed by one of the experts, where it is mentioned that:

"I agree because, in fact their future employers need to be involved so that they know the readiness of the students." (IE1)

Another possible method is through the implementation of communication across curriculum, where technical communication skills are being integratedacross technical subjects. This is important because students are able to apply these skills across different working settings, as emphasized by one of the experts:

"I agree. Make it multidisciplinary (where it is being taught) across all sections (subjects), and transdisciplinary, where one person can do all. That means that a worker who is working at Company A can also work at Company C." (IE1).

On the other hand, there are two additional suggestions proposed by the experts. The first one is online learning activity. The experts believed that in the current industry and learning settings, technology is an important platform for work and learning. The experts mentioned that:

"Online is not here? Need to include online (learning)… online learning activities… like share documents… like school teachers we have professional learning communities… is whereby… you can work together to share module or others (resources)." (AC1)

"They (students) will learn to share everything professionally." (AC1)

Secondly, the experts also suggested contextualized learning activities. This is because students are able to learn and develop their technical communication skills in a real working environment. Also, the teachers can benefit from this activity, as they are able to understand the nature of working in industry and help students to improve in certain areas of communication in industry.

"Contextualized learning activities, I want it to be included because English teachers need to experience what we called working environment

for students in their respective field. Let's say, when students made presentations, they made group work activities: they have tasks, and here is when the English teacher analyze the types of communication occurred so that they (English teachers) can advise when they (students) are working in groups. Because if they made up a conversation activity, it is not real (authentic) right? More to role play, right? So, if they (English teachers) are together in the fieldwork, then they can see that the students lack of communication skills and they (English teachers) can enhance the tasks (teaching and learning activities)." (AC2).

Assessment Method. Based on the interview, the experts generally agreed that oral presentation, library-based research, terminology exams, observation on students' communicative experiences during field work training, and observation on students' communicative experiences in group activities / team work projects are the important assessment methods to develop technical communication skills among students in Malaysian Vocation Colleges.

As appointed by one of the experts, oral presentation tasks are relevant to be integrated in developing students' technical communication skills. In fact, the expert mentioned that the current practice employs this method in the current teaching practice of TVET:

"Yes. This is typically used in Vocational Colleges." (TE1).

The experts also agreed that library-based research should be considered as one of the assessment methods. One of the experts justified that this method is beneficial in developing students' ability in browsing information and use it in completing work.

"Yes, and (students) need to know how to browse (resources) and use system." (IE1).

Other than that, the experts agreed that observation on students' communicative experiences during field work training and on students' communicative experiences in group activities / team work projects are among important assessment methods to develop technical communication skills. This method is relevant and currently practiced in TVET institutions:

"Yes. [Typically used in Vocational Colleges.]" (TE1)

However, one expert cautioned that this method is suitable if the students are equipped with knowledge of the field, especially in term of terminology and vocabulary used in the industry.

"Important, but depends on the areas (of the sectors). There are certain terms they need to know and master." (IE1)

On the other hand, there are two items suggested by the experts for the assessment methods: a) students' responses in online forum discussion, and b) portfolios.

One of the experts expressed that online learning platform is relevant to be used as medium of instruction and assessment.

"When you say communicative assessment that includes online… like in higher education level they have online forum discussion… I think you have to introduce them to ICT related (communication/discussion) compared to only old method, right? I think it is a good way to have a forum discussion and then when they participated on online forum discussion, then we (teachers/instructors) can evaluate them" (AC1)

For portfolios assessment, the TVET expert suggested that it should be implemented in help assessing students' technical communication skills as it complies with the National Assessment of Malaysian TVET.

"At the moment, in technical education field especially Vocational Colleges, a number of assessments are by portfolios, because they (education evaluation process) emphasize on portfolios." (AC2)

Perceived importance of Technical Communication Pedagogical Model (for Students and Teachers). The experts generally agreed that the proposed Technical Communication Pedagogical Model has importance in developing students' technical communication skills. In the perspective of students, the proposed model is helpful as it considers students' prior knowledge and their prior communicative experiences. One of the experts highlighted that the proposed model will enhance students' prior knowledge and in turn will help develop them to be more knowledgeable:

"Yes, so that they are more knowledgeable." (IE1).

In addition, for teachers, the proposed model will help benefit the teachers in conducting effective lessons to develop students' technical communication skills. This is because, as appointed by one of the experts, the model can serve as a guidance for effective teaching practices. And the expert suggested that the teachers should be in the process from beginning until the end.

"Important, and the teachers must be available throughout the learning process; classroom and field work." (IE1)

In addition, the proposed model will benefit teachers in term of selecting appropriate assessment method in evaluating students' technical communication skills. It is also suggested that the evaluator (which is the teacher) must made available from the beginning until the end of the process.

"Yes, and (the evaluator) must be the same person that evaluates them from beginning because sometimes students' attitude different [from one

class to another]. So, need to (be the same person) to supervise until the end. If (he/she) needs co-supervisor he/she needs to monitor from beginning as well." (IE1).

Perceived importance of English language proficiency to Technical Communication Pedagogical Model. The experts generally agreed English language proficiency plays an important role to technical communication skills development. For instance, the ability to construct accurate sentence structure is important in avoiding miscommunication:

"Yes, to avoid miscommunication." (IE1).

In addition, the ability to apply accurate vocabulary is viewed important for effective communication at work:

"Yes, if you use inaccurate vocab, it will affect the work." (IE1).

Other than that, the ability to apply accurate spelling in writing is viewed important for communication at work:

"Yes, because (it reflects) the company; corporate image." (IE1)

"Yes, especially when [you are in charge with] customers, they will [refer back what you wrote] word by word." (IE2).

Also, the ability to communicate with accurate pronunciation in English is viewed important for effective communication at work as it helps overcome miscommunication due to the use of different dialects that affect communication:

"Important, [but] need more trainings because our local industry [is constituted] from five different corridors (states) with different styles (dialects)." (IE1)

In short, it is important to consider English language proficiency in technical communication skills development as the aforementioned skills are beneficial in avoiding miscommunication at work.

Findings of Fuzzy Delphi Analysis

After the fuzzy delphi instrument has been revised and finalized based on the findings of the semi-structured interview, it has been administered to all 17 experts. The instrument comprises four sections: Section A: Demographic Profile, Section B: Components of Technical Communication Pedagogical Model (Section B1: Objective, Section B2: Content of Learning, Section B3: Method of Delivery, and Section B4: Assessment Method), Section C: Perceived Importance of Technical Communication Pedagogical Model (C1: For Students, and C2: For Teachers), and Section D: Perceived Importance of English Language Proficiency to Technical Communication Pedagogical Model. The overall findings for Section B, C, D and E are presented in this section.

Objective. In this section, the fuzzy delphi results for objective items are presented. Table 4.6 presents the summary of threshold values for objective items, and Table 4.7 presents the summary of experts' consensus values for objective items.

Table 4.6

Summary of threshold values for objective items

Expert	Item 1	2	3	4	5	6	7
1	0.1	0.1	0.2	0.2	0.1	0.1	0.1
2	0.2	0.1	0.1	0.2	0.1	0.2	0.1
3	0.1	0.2	0.2	0.2	0.2	0.2	0.1
4	0.1	0.1	0.1	0.2	0.2	0.2	0.1
5	**0.4**	0.2	0.2	0.2	0.2	**0.4**	0.2
6	0.1	0.1	0.1	0.2	0.2	0.2	0.2
7	0.1	0.2	0.2	0.2	0.1	0.1	0.2
8	0.1	0.2	0.2	0.2	0.2	0.1	0.2
9	0.2	0.1	0.1	0.2	0.1	0.2	0.1
10	0.2	0.1	0.1	0.2	0.1	0.1	0.1
11	0.1	0.2	0.2	**0.8**	0.1	0.2	0.1
12	0.2	0.1	0.1	0.2	0.1	0.2	0.2
13	0.1	0.2	0.1	**0.4**	0.1	0.2	0.1
14	0.2	0.1	0.1	**0.4**	0.1	0.2	0.1
15	0.1	0.2	0.2	**0.4**	0.2	**0.4**	0.2
16	0.2	0.1	0.1	0.2	0.1	0.2	0.1
17	0.1	0.2	0.2	0.2	0.2	0.1	0.2
***d* value for each item**	2.588	2.588	2.588	4.205	2.516	3.235	2.516
Total of *d* value				20.235			
***d* value for construct**				20.343 / (17 X 7) = 0.171			

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.7

Summary of experts' consensus values for objective items

	Item						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Total of accepted items	16	17	17	13	17	15	17
Consensus value (%)	94%	100%	100%	76%	100%	88%	100%

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted
*items achieving consensus value <75% are rejected

Table 4.8

Summary of accepted items for objective.

Item	Objective	Fuzzy Evaluation	Defuzzification	Ranking
1	The objective of technical communication pedagogical model is to develop oral communication skills that are relevant to the industry.	(7.80, 11.20, 14.60)	0.659	4
2	The objective of technical communication pedagogical model is to develop written communication skills that are relevant to the industry.	(8.60, 12.00, 15.40)	0.706	2
3	The objective of technical communication pedagogical model is to develop interpersonal skills that are relevant to the industry.	(8.60, 12.00, 15.40)	0.706	2
4	The objective of technical communication pedagogical model is to develop researching skills that are relevant to the industry	(8.40, 11.80, 15.20)	0.694	3
5	The objective of technical communication pedagogical model is to provide work-related communicative experiences for students.	(8.80, 12.20, 15.60)	0.718	1
6	The objective of technical communication pedagogical model is to guide teaching and learning for communication skills in technical field.	(8.40, 11.80, 15.20)	0.694	3
7	The objective of technical communication pedagogical model is to expose students with authentic communicative experiences in the real settings of the industry.	(8.80, 12.20, 15.60)	0.718	1

Based on the result in Table 4.8, the experts agreed that the objectives/focuses of learning of technical communication pedagogical model are to:

1. provide work-related communicative experiences for students, with defuzzification value of 0.659, and ranking of 1;
2. expose students with authentic communicative experiences in the real settings of the industry, with defuzzification value of 0.659, and ranking of 1;
3. develop written communication skills that are relevant to the industry, with defuzzification value of 0.706, and ranking of 2;
4. develop interpersonal skills that are relevant to the industry, with defuzzification value of 0.706, and ranking of 2;
5. develop researching skills that are relevant to the industry, with defuzzification value of 0.694, and ranking of 3;
6. guide teaching and learning for communication skills in technical field, with defuzzification value of 0.694, and ranking of 3; and
7. develop oral communication skills that are relevant to the industry, with defuzzification value of 0.659, and ranking of 4.

Content of learning. In this section, the fuzzy delphi results for content of learning items are presented according to four sections: a) oral technical communication skills, b) written technical communication skills, c) interpersonal skill, and d) researching skills.

For oral technical communication skills, Table 4.9presents the summary of threshold values for oral technical communication skills items, and Table 4.10 presents the summary of experts' consensus values for oral technical communication skills items.

Table 4.9

Summary of threshold values for oral technical communication skills items.

Expert	Item									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	0.1	0.1	0.2	**0.3**	0.2	0.1	0.1	0.1	0.2	**0.3**
2	0.2	0.2	0.2	**0.3**	0.2	0.2	0.2	0.1	0.2	**0.3**
3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
4	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2	**0.3**
5	0.1	0.1	**0.7**	0.1	0.1	0.2	0.1	0.1	0.1	0.0
6	0.1	0.1	0.1	**0.3**	0.1	0.1	0.1	0.2	0.1	0.0
7	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.0
8	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.0
9	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.2	**0.3**
10	0.2	0.2	0.2	**0.3**	0.2	0.2	0.2	0.1	0.2	**0.3**
11	0.1	0.1	0.1	**0.7**	0.1	0.1	0.1	0.2	**0.7**	**0.6**
12	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	**0.3**
13	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.0
14	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.1	**0.6**
15	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.0
16	0.1	0.1	0.2	**0.3**	0.2	0.2	0.2	0.2	0.1	0.0
17	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.0
***d* value for each item**	2.157	2.157	3.163	2.516	2.372	2.588	2.541	2.588	2.803	3.235
Total of *d* value	26.118									
***d* value for construct**	26.118/(17x10)=0.154									

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.10

Summary of experts’ consensus values for oral technical communication skills items.

	Item									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Total of accepted items	17	17	16	**11**	17	17	17	17	16	**9**
Consensus value (%)	100%	100%	94%	**65%**	100%	100%	100%	100%	94%	**53%**

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted

*items achieving consensus value <75% are rejected

Table 4.11

Summary of accepted items for oral technical communication skills.

Item	Oral technical communication skills	Fuzzy Evaluation	Defuzzification	Ranking
1	The ability to find a situation that suits an oral presentation is important to be emphasized in the content of learning.	(7.80, 11.20, 14.60)	0.659	5
2	The ability to define audience is important to be emphasized in the content of learning.	(7.80, 11.20, 14.60)	0.659	5
3	The ability to define communication purpose is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	4
5	The ability to plan and develop the content of oral presentations is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	4
6	The ability to plan and prepare visual aids (for larger audience) is important to be emphasized in the content of learning.	(8.40, 11.80, 15.20)	0.694	2
7	The ability to plan an introduction and conclusion of oral presentations is important to be emphasized in the content of learning.	(8.20, 11.60, 15.00)	0.682	3
8	The ability to deliver a speech to audience is important to be emphasized in the content of learning.	(8.60, 12.00, 15.40)	0.706	1
9	The ability to chair a meeting is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	6

Based on the result in Table 4.11, the experts agreed that:

1. the ability to deliver a speech to audience is important to be emphasized in the content of learning, with defuzzification value of 0.706, and ranking of 1;

2. the ability to plan and prepare visual aids (for larger audience) is important to be emphasized in the content of learning, with defuzzification value of 0.694, and ranking of 2;
3. the ability to plan an introduction and conclusion of oral presentations is important to be emphasized in the content of learning, with defuzzification value of 0.682, and ranking of 3;
4. the ability to define communication purpose is important to be emphasized in the content of learning, with defuzzification value of 0.671, and ranking of 4;
5. the ability to plan and develop the content of oral presentations is important to be emphasized in the content of learning, with defuzzification value of 0.671, and ranking of 4;
6. the ability to find a situation that suits an oral presentation is important to be emphasized in the content of learning, with defuzzification value of 0.659, and ranking of 5;
7. the ability to define audience is important to be emphasized in the content of learning, with defuzzification value of 0.659, and ranking of 5; and
8. the ability to chair a meeting is important to be emphasized in the content of learning, with defuzzification value of 0.647, and ranking of 6.

Meanwhile, the items rejected by experts are:

1. Item 4: The ability to research on a topic is important to be emphasized in the content of learning (achieving consensus value of 65%); and
2. Item 10: The ability to present in a conference is important to be emphasized in the content of learning (achieving consensus value of 53%).

For written technical communication skills, Table 4.12presents the summary of threshold values for written technical communication skills items, and Table

4.13presents the summary of experts' consensus values for written technical communication skills items.

Table 4.12

Summary of threshold values for written technical communication skills items

Expert	Item									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	0.2	0.0	**0.3**	**0.3**	0.0	**0.3**	**0.3**	**0.3**	0.0	0.1
2	0.2	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	0.0	0.0	0.1
3	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
4	0.2	0.0	**0.3**	0.1	0.0	0.0	**0.3**	**0.3**	0.0	0.1
5	0.1	**0.3**	**0.3**	**0.4**	**0.6**	0.0	0.0	0.0	**0.3**	0.1
6	0.2	0.0	**0.3**	0.1	0.0	**0.3**	0.0	0.0	**0.3**	0.2
7	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
8	0.1	0.0	0.0	0.1	0.0	**0.3**	0.0	**0.3**	**0.3**	**0.4**
9	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
10	0.2	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	0.0	**0.3**	**0.3**	**0.4**
11	**0.4**	**0.3**	**0.3**	0.1	0.0	**0.3**	**0.6**	**0.6**	**0.3**	**0.5**
12	0.1	0.0	0.0	0.1	0.0	**0.3**	0.0	**0.3**	**0.3**	0.2
13	0.1	**0.3**	**0.3**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	0.2
14	0.2	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	0.2
15	0.1	**0.3**	0.0	0.1	0.0	0.0	**0.3**	0.0	0.0	0.1
16	0.2	**0.3**	**0.3**	**0.3**	**0.3**	0.0	0.0	**0.3**	**0.3**	0.2
17	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
***d* value for each item**	2.768	2.696	3.235	2.516	2.336	2.875	2.785	3.235	2.875	3.199
Total of *d* value	28.519									
***d* value for construct**	28.519/(17X10)=0.168									

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.13

Summary of experts' consensus values for written technical communication skills items.

	Item									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Total of accepted items	16	**9**	**7**	**10**	**11**	**8**	**10**	**8**	**8**	14
Consensus value (%)	94%	**53%**	**41%**	**59%**	**65%**	**47%**	**59%**	**47%**	**47%**	82%

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted

*items achieving consensus value <75% are rejected

Table 4.14

Summary of accepted items for written technical communication skills.

Item	Written technical communication skills	Fuzzy Evaluation	Defuzzification	Ranking
1	The ability to produce business letters is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	1
10	The ability to produce technical journalism is important to be emphasized in the content of learning.	(5.80, 9.20, 12.60)	0.541	2

Based on the result in Table 4.14, the experts agreed that:

1. the ability to produce business letters is important to be emphasized in the content of learning, with defuzzification value of 0.671, and ranking of 1; and
2. the ability to produce technical journalism is important to be emphasized in the content of learning, with defuzzification value of 0.541, and ranking of 2.

Meanwhile, the items rejected by experts are:

1. Item 2: The ability to produce user guides document is important to be emphasized in the content of learning (achieving consensus value of 53%);
2. Item 3: The ability to produce online helps document is important to be emphasized in the content of learning (achieving consensus value of 41%);
3. Item 4: The ability to produce technical-support document is important to be emphasized in the content of learning (achieving consensus value of 59%);
4. Item 5: The ability to produce reference information document is important to be emphasized in the content of learning (achieving consensus value of 65%);
5. Item 6: The ability to produce consumer literature is important to be emphasized in the content of learning (achieving consensus value of 47%);

6. Item 7: The ability to produce marketing literature is important to be emphasized in the content of learning (achieving consensus value of 59%);
7. Item 8: The ability to produce research report is important to be emphasized in the content of learning (achieving consensus value of 47%); and
8. Item 9: The ability to produce consultant technical document is important to be emphasized in the content of learning (achieving consensus value of 47%).

For interpersonal skills, Table 4.15presents the summary of threshold values for interpersonal skills items, and Table 4.16presents the summary of experts' consensus values for interpersonal skills items.

Table 4.15

Summary of threshold values for interpersonal skills items

Expert	Item 1	2	3	4	5	6	7	8	9	10
1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.1
2	0.1	0.1	0.1	0.1	0.2	0.1	**0.3**	0.2	0.1	0.1
3	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.1	0.2	0.2
4	0.1	0.2	0.1	0.1	0.1	0.1	**0.3**	**0.4**	0.1	0.1
5	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.2
6	0.1	0.1	0.1	0.1	0.2	0.1	**0.3**	0.1	0.1	0.1
7	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.1	0.2	0.2
8	0.2	0.2	0.2	0.2	0.1	0.1	**0.3**	0.1	0.2	0.2
9	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.1	0.2	0.2
10	0.1	0.1	0.1	0.1	0.1	**0.3**	**0.3**	0.2	0.1	0.1
11	0.1	0.1	0.2	**0.5**	0.2	0.1	**0.6**	0.1	0.2	0.2
12	0.1	0.1	0.1	0.1	0.2	**0.3**	0.0	0.2	0.1	0.1
13	0.1	0.1	0.1	0.1	0.2	**0.3**	0.0	0.1	0.2	0.1
14	0.1	0.1	0.1	0.1	0.2	**0.3**	**0.3**	0.2	0.1	0.1
15	0.1	0.1	0.2	0.1	**0.4**	**0.4**	**0.3**	0.1	0.1	0.1
16	0.1	0.2	0.2	0.1	**0.4**	0.1	**0.3**	0.2	0.1	0.1
17	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.1	0.2	0.2
***d* value for each item**	2.372	2.588	2.588	2.768	2.803	2.013	3.386	2.768	2.516	2.516
Total of *d* value						26.317				
***d* value for construct**						26.317/(17x10)=0.155				

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.16

Summary of experts' consensus values for interpersonal skills items.

	Item									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Total of accepted items	17	17	17	16	15	**12**	**8**	16	17	17
Consensus value (%)	100%	100%	100%	94%	88%	**71%**	**47%**	94%	100%	100%

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.17

Summary of accepted items for interpersonal skills.

Item	Written technical communication skills	Fuzzy Evaluation	Defuzzification	Ranking
1	The ability to communicate effectively with co-workers and administrators is important to be emphasized in the content of learning.	(9.00, 12.40, 15.80)	0.729	1
2	The ability to effectively give instructions is important to be emphasized in the content of learning.	(8.60, 12.00, 15.40)	0.706	3
3	The ability to give constructive feedbacks is important to be emphasized in the content of learning.	(8.60, 12.00, 15.40)	0.706	3
4	The ability to establish professional relationships with customers and co-workers is important to be emphasized in the content of learning.	(8.80, 12.20, 15.60)	0.718	2
5	The ability to share information in small group settings is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	5
8	The multicultural awareness is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	4
9	The ability to positively handle conflicts within groups is important to be emphasized in the content of learning.	(8.80, 12.20, 15.60)	0.718	2
10	The leadership skills are important to be emphasized in the content of learning.	(8.80, 12.20, 15.60)	0.718	2

Based on the result in Table 4.17, the experts agreed that:

1. the ability to communicate effectively with co-workers and administrators is important to be emphasized in the content of learning, with defuzzification value of 0.729, and ranking of 1;

2. the ability to establish professional relationships with customers and co-workers is important to be emphasized in the content of learning, with defuzzification value of 0.718, and ranking of 2;
3. the ability to positively handle conflicts within groups is important to be emphasized in the content of learning, with defuzzification value of 0.718, and ranking of 2;
4. the leadership skills are important to be emphasized in the content of learning, with defuzzification value of 0.718, and ranking of 2;
5. the ability to effectively give instructions is important to be emphasized in the content of learning, with defuzzification value of 0.706, and ranking of 3;
6. the ability to give constructive feedbacks is important to be emphasized in the content of learning, with defuzzification value of 0.706, and ranking of 3;
7. the multicultural awareness is important to be emphasized in the content of learning, with defuzzification value of 0.671, and ranking of 4; and
8. the ability to share information in small group settings is important to be emphasized in the content of learning, with defuzzification value of 0.647, and ranking of 5.

Meanwhile, the items rejected by experts are:

1. Item 6: The ability to share information in organizational settings is important to be emphasized in the content of learning, (achieving consensus value of 71%); and
2. Item 7: The ability to share information to public is important to be emphasized in the content of learning, (achieving consensus value of 47%).

For researching skills, Table 4.18presents the summary of threshold values for researching skills items, and Table 4.19 presents the summary of experts' consensus values for researching skills items.

Table 4.18

Summary of threshold values for researching skills items.

Expert	Item						
	1	2	3	4	5	6	7
1	0.1	0.1	**0.3**	0.2	0.2	0.2	**0.3**
2	0.1	0.1	0.0	0.1	0.1	0.1	**0.3**
3	0.1	0.1	0.0	0.1	0.1	0.1	0.0
4	0.1	0.2	0.0	0.1	0.1	0.1	0.0
5	0.1	0.1	0.0	0.1	0.1	**0.4**	**0.3**
6	0.1	0.1	0.0	0.1	0.2	0.1	**0.3**
7	0.1	0.1	0.0	0.1	0.1	0.1	0.0
8	0.1	0.1	0.0	0.1	0.1	0.1	0.0
9	0.1	0.1	0.0	0.1	0.1	0.1	0.0
10	0.2	0.2	**0.3**	0.2	0.2	0.2	**0.3**
11	0.1	0.1	0.0	0.1	0.2	0.2	**0.6**
12	0.2	0.2	0.0	0.2	0.2	0.2	**0.3**
13	0.2	0.1	**0.3**	0.2	0.2	**0.4**	**0.3**
14	0.2	0.2	**0.3**	0.2	0.2	0.2	**0.3**
15	0.1	0.1	0.0	0.1	0.2	0.2	0.0
16	0.1	0.1	0.0	0.2	0.1	0.1	**0.3**
17	0.1	0.1	0.0	0.1	0.1	0.1	0.0
***d* value for each item**	1.869	1.869	1.617	2.372	2.588	2.803	3.486
Total of *d* value				16.605			
***d* value for construct**				16.605/(17x7)=0.140			

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.19

Summary of experts' consensus values for researching skills items.

	Item						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Total of accepted items	17	17	13	17	17	15	**7**
Consensus value (%)	100%	100%	76%	100%	100%	88%	**41%**

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted

*items achieving consensus value <75% are rejected

Table 4.20

Summary of accepted items for researching skills.

Item	Researching Skills	Fuzzy Evaluation	Defuzzification	Ranking
1	The ability to retrieve relevant information is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	3
2	The ability to gather and organize relevant information is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	3
3	The ability to comprehend job-related journal and technical materials is important to be emphasized in the content of learning.	(7.20, 10.60, 14.00)	0.624	4
4	The ability to distinguish main ideas from supporting details is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	2
5	The knowledge on how to operate technological tools to improve communication is important to be emphasized in the content of learning.	(8.40, 11.80, 15.20)	0.694	1
6	An awareness of how technological tools help to promote social-interactions and collaboration at work is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	3

Based on the result in Table 4.20, the experts agreed that:

1. the knowledge on how to operate technological tools to improve communication is important to be emphasized in the content of learning, with defuzzification value of 0.694, and ranking of 1;
2. the ability to distinguish main ideas from supporting details is important to be emphasized in the content of learning, with defuzzification value of 0.671, and ranking of 2;
3. the ability to retrieve relevant information is important to be emphasized in the content of learning, with defuzzification value of 0.647, and ranking of 3;

4. the ability to gather and organize relevant information is important to be emphasized in the content of learning, with defuzzification value of 0.647, and ranking of 3;
5. an awareness of how technological tools help to promote social-interactions and collaboration at work is important to be emphasized in the content of learning, with defuzzification value of 0.647, and ranking of 3; and
6. the ability to comprehend job-related journal and technical materials is important to be emphasized in the content of learning, with defuzzification value of 0.624, and ranking of 4.

Meanwhile, the item rejected by experts is:

1. Item 7: The ability to research how users utilize technologies is important to be emphasized in the content of learning (achieving consensus value of 41%).

Method of delivery. In this section, the fuzzy delphi results for method of delivery items are presented. Table 4.21presents the summary of threshold values for method of delivery items, and Table 4.22presents the summary of experts' consensus values for method of delivery items.

Table 4.21

Summary of threshold values for method of delivery items.

Expert	Item										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	0.2	0.2	0.1	0.1	0.1	**0.3**	0.0	0.0	0.2	**0.4**	0.1
2	0.2	0.2	0.1	0.1	**0.4**	**0.3**	**0.3**	**0.3**	0.2	0.2	0.2
3	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.1
4	0.1	0.2	0.1	0.1	0.1	0.1	**0.3**	0.0	0.1	0.1	0.1
5	**0.4**	0.1	0.2	0.2	**0.5**	0.1	**0.3**	**0.3**	0.1	0.1	0.1
6	0.2	0.2	0.2	0.1	0.1	**0.4**	0.0	0.0	0.1	0.1	0.2
7	0.2	0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1
8	0.2	0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1
9	0.1	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.1
10	0.2	0.1	0.1	0.2	0.1	0.1	0.0	**0.3**	0.2	0.2	0.2
11	**0.4**	**0.4**	0.1	0.1	**0.5**	0.1	0.0	0.0	0.1	0.2	0.2
12	0.1	0.2	0.1	0.1	0.1	**0.3**	**0.3**	0.0	0.2	0.2	0.2
13	**0.5**	0.2	0.1	0.1	0.1	0.1	**0.3**	0.0	**0.4**	**0.4**	0.1
14	0.1	0.2	0.1	0.1	**0.4**	0.1	0.0	0.0	0.1	0.2	0.2
15	**0.4**	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.2
16	**0.4**	**0.4**	0.1	0.2	0.1	**0.3**	**0.3**	0.0	0.2	0.2	0.2
17	0.1	0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1
***d* value for each item**	4.061	3.163	2.516	2.588	3.091	2.013	1.908	1.150	2.588	3.019	2.588
Total of *d* value	28.685										
***d* value for construct**	28.685/(17x11)=0.153										

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.22

Summary of experts' consensus values for method of delivery items.

	Item										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Total of accepted items	**12**	15	17	17	13	**12**	**11**	14	16	15	17
Consensus value (%)	**71%**	88%	100%	100%	76%	**71%**	**65%**	82%	94%	88%	100%

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted

*items achieving consensus value <75% are rejected

Table 4.23

Summary of accepted items for method of delivery.

Item	Method of Delivery	Fuzzy Evaluation	Defuzzification	Ranking
2	Practical tutorial is a relevant method of delivery to develop students' technical communication skills.	(8.00, 11.40, 14.80)	0.671	4
3	Collaborative learning activity is a relevant method of delivery to develop students' technical communication skills.	(8.80, 12.20, 15.60)	0.718	1
4	Field training is a relevant method of delivery to develop students' technical communication skills.	(8.60, 12.00, 15.40)	0.706	2
5	Online learning activity is a relevant method of delivery to develop students' technical communication skills.	(6.00, 9.40, 12.80)	0.553	7
8	Communication module which introduces technical communication across technical subjects is a relevant method of delivery to develop students' technical communication skills.	(7.00, 10.40, 13.80)	0.612	6
9	Expert feedback from technical field on the content and task for learning is a relevant method of delivery to develop students' technical communication skills.	(7.80, 11.20, 14.60)	0.659	5
10	Communication across curriculum (integrates technical communication skills across technical subjects) is a relevant method of delivery to develop students' technical communication skills.	(7.80, 11.20, 14.60)	0.659	5
11	Contextualized learning activity (which is conducted in an authentic working environment) is a relevant method of delivery to develop students' technical communication skills.	(8.40, 11.80, 15.20)	0.694	3

Based on the result in Table 4.23, the experts agreed that:

1. collaborative learning activity is a relevant method of delivery to develop students' technical communication skills, with defuzzification value of 0.718, and ranking of 1;
2. field training is a relevant method of delivery to develop students' technical communication skills, with defuzzification value of 0.706, and ranking of 2;
3. contextualized learning activity (which is conducted in an authentic working environment) is a relevant method of delivery to develop students' technical communication skills, with defuzzification value of 0.694, and ranking of 3;
4. practical tutorial is a relevant method of delivery to develop students' technical communication skills, with defuzzification value of 0.671, and ranking of 4;
5. expert feedback from technical field on the content and task for learning is a relevant method of delivery to develop students' technical communication skills, with defuzzification value of 0.659, and ranking of 5;
6. communication across curriculum (integrates technical communication skills across technical subjects) is a relevant method of delivery to develop students' technical communication skills, with defuzzification value of 0.659, and ranking of 5;
7. communication module which introduces technical communication across technical subjects is a relevant method of delivery to develop students' technical communication skills, with defuzzification value of 0.612, and ranking of 6; and
8. online learning activity is a relevant method of delivery to develop students' technical communication skills, with defuzzification value of 0.553, and ranking of 7.

Meanwhile, the items rejected by experts are:

1. Item 1: Formal lecture is a relevant method of delivery to develop students' technical communication skills (achieving consensus value of 71%);
2. Item 6: Teaching partnership between language and technical department is a relevant method of delivery to develop students' technical communication skills (achieving consensus value of 71%); and
3. Item 7: Team teaching (teaching collaboration between technical and English language instructors during a lesson) is a relevant method of delivery to develop students' technical communication skills (achieving consensus value of 65%).

Assessment method. In this section, the fuzzy delphi results for assessment method items are presented. Table 4.24 presents the summary of threshold values for assessment method items, and Table 4.25presents the summary of experts' consensus values for assessment method items.

Table 4.24

Summary of threshold values for assessment method items.

Expert	**Item**								
	1	2	3	4	5	6	7	8	9
1	**0.3**	0.2	0.0	0.1	**0.4**	0.1	0.1	0.0	0.0
2	**0.3**	0.2	**0.3**	0.2	**0.4**	0.2	0.2	**0.3**	**0.3**
3	0.0	0.1	0.0	0.1	0.1	0.2	0.1	0.0	0.0
4	0.0	**0.4**	0.0	0.1	0.1	**0.4**	0.1	0.0	0.0
5	0.0	0.2	0.0	**0.4**	**0.5**	0.1	0.1	0.0	**0.3**
6	0.0	0.1	0.0	0.2	0.1	0.2	0.2	0.0	**0.3**
7	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0
8	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0
9	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0
10	**0.3**	0.2	0.0	0.2	0.1	0.2	0.2	0.0	**0.3**
11	**0.6**	**0.4**	**0.6**	**0.4**	**0.5**	0.1	0.2	**0.6**	0.0
12	0.0	0.2	0.0	0.2	0.1	0.2	0.2	0.0	**0.3**
13	**0.3**	0.2	0.0	0.2	0.2	0.2	0.2	0.0	0.0
14	0.0	0.2	**0.3**	0.2	0.1	0.2	0.2	**0.3**	**0.3**
15	**0.6**	0.1	**0.3**	0.2	0.1	0.2	0.2	**0.3**	**0.6**
16	**0.3**	0.2	**0.3**	0.2	0.2	0.2	0.2	0.0	**0.3**
17	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0
***d* value for each item**	2.875	3.163	2.228	3.163	3.091	2.911	2.746	1.725	2.875
Total of *d* value	24.778/(17X9)=0.162								
***d* value for construct**	0.162								

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.25

Summary of experts' consensus values for assessment method items.

	Item								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Total of accepted items	**10**	15	**12**	15	13	16	17	13	**9**
Consensus value (%)	**59%**	88%	**71%**	88%	76%	94%	100%	76%	**53%**

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted

*items achieving consensus value <75% are rejected

Table 4.26

Summary of accepted items for assessment method.

Item	Assessment Method	Fuzzy Evaluation	Defuzzification	Ranking
2	Oral presentations are relevant to help assess students' technical communication skills.	(8.00, 11.40, 14.80)	0.671	3
4	Writing technical document tasks are relevant to help assess students' technical communication skills.	(8.00, 11.40, 14.80)	0.671	3
5	Terminology exams are relevant to help assess students' technical communication skills.	(6.00, 9.40, 12.80)	0.553	5
6	Observation on students' communicative experiences during field work training are relevant to help assess students' technical communication skills.	(8.40, 11.80, 15.20)	0.694	2
7	Observation on students' communicative experiences in group activities / team work projects are relevant to help assess students' technical communication skills.	(8.60, 12.00, 15.40)	0.706	1
8	Students' responses in online forum discussion are relevant to be observed to help assess students' technical communication skills.	(7.00, 10.40, 13.80)	0.612	4

Based on the result in Table 4.26, the experts agreed that:

1. observation on students' communicative experiences in group activities / team work projects are relevant to help assess students' technical communication skills, with defuzzification value of 0.706, and ranking of 1;

2. observation on students' communicative experiences during field work training are relevant to help assess students' technical communication skills, with defuzzification value of 0.694, and ranking of 2;
3. oral presentations are relevant to help assess students' technical communication skills, with defuzzification value of 0.671, and ranking of 3;
4. writing technical document tasks are relevant to help assess students' technical communication skills, with defuzzification value of 0.671, and ranking of 3;
5. students' responses in online forum discussion are relevant to be observed to help assess students' technical communication skills, with defuzzification value of 0.612, and ranking of 4; and
6. terminology exams are relevant to help assess students' technical communication skills, with defuzzification value of 0.553, and ranking of 5.

Meanwhile, the items rejected by experts are:

1. Item 1: Research reports are relevant to help assess students' technical communication skills (achieving consensus value of 59%);
2. Item 3: Library-based research tasks are relevant to help assess students' technical communication skills (achieving consensus value of 71%); and
3. Item 9: Portfolios are relevant to help assess students' technical communication skills (achieving consensus value of 53%).

Perceived importance of Technical Communication Pedagogical Model. In this section, the fuzzy delphi results for perceived importance of technical communication pedagogical model items are presented according to two sections: a) importance to students, and b) importance to teachers.

For students, Table 4.27presents the summary of threshold values for perceived importance of technical communication pedagogical model items, and Table 4.28presents the summary of experts' consensus values for perceived importance of technical communication pedagogical model items.

Table 4.27

Summary of threshold values for perceived importance of technical communication pedagogical model (for students).

Expert	**Item**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	0.1	0.1	**0.3**	0.1	0.1	0.1	0.2	0.1
2	0.2	0.1	0.1	0.2	0.2	**0.3**	0.1	0.2
3	0.1	**0.3**	**0.3**	0.1	0.2	**0.3**	0.2	0.2
4	0.2	**0.3**	0.1	0.1	0.1	0.1	0.1	0.1
5	0.1	**0.4**	**0.4**	0.1	0.1	**0.4**	0.1	0.1
6	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2
7	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
8	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
10	0.2	0.1	0.1	0.2	0.1	**0.3**	0.2	0.2
11	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
12	0.2	**0.3**	**0.3**	0.2	0.2	0.1	0.2	0.2
13	0.2	**0.3**	**0.3**	0.2	0.2	**0.3**	0.2	0.2
14	0.2	**0.3**	**0.3**	0.2	0.2	**0.3**	0.2	0.2
15	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
16	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.2
17	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
***d* value for each item**	2.588	2.516	2.516	2.588	2.768	2.516	2.875	2.875
Total of *d* value	21.242/(17X8)=							
***d* value for construct**	0.156							

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.28

Summary of experts' consensus values for perceived importance of technical communication pedagogical model (for students).

	Item							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Total of accepted items	16	**10**	**10**	16	16	**10**	16	16
Consensus value (%)	94%	**59%**	**59%**	94%	94%	**59%**	94%	94%

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted

*items achieving consensus value <75% are rejected

Table 4.29

Summary of accepted items for perceived importance of technical communication pedagogical model (for students).

Item	Perceived importance of Technical Communication Pedagogical Model (for Students)	Fuzzy Evaluation	Defuzzification	Ranking
1	The pedagogical model considers students' prior knowledge in developing communication skills for work.	(7.80, 11.20, 14.60)	0.659	3
4	The pedagogical model is appropriate to students' prior communicative experiences in classroom.	(7.80, 11.20, 14.60)	0.659	3
5	The pedagogical model is appropriate to students' prior communicative experiences during field work.	(8.00, 11.40, 14.80)	0.671	2
7	The pedagogical model will help to encourage students to practice communication skills for work during instruction hour.	(8.20, 11.60, 15.00)	0.682	1
8	The pedagogical model will help to encourage students to practice communication skills for work in an authentic learning environment.	(8.20, 11.60, 15.00)	0.682	1

Based on the result in Table 4.29, the experts agreed that:

1. the pedagogical model will help to encourage students to practice communication skills for work during instruction hour, with defuzzification value of 0.682, and ranking of 1;
2. the pedagogical model will help to encourage students to practice communication skills for work in an authentic learning environment, with defuzzification value of 0.682, and ranking of 1;

3. the pedagogical model is appropriate to students' prior communicative experiences during field work, with defuzzification value of 0.671, and ranking of 2;
4. the pedagogical model considers students' prior knowledge in developing communication skills for work, with defuzzification value of 0.659, and ranking of 3; and
5. the pedagogical model is appropriate to students' prior communicative experiences in classroom, with defuzzification value of 0.659, and ranking of 3.

Meanwhile, the items rejected by experts are:

1. Item 2: The pedagogical model will help to generate students' prior knowledge on communication skills for work (achieving consensus value of 59%);
2. Item 3: The pedagogical model will help to activate students' prior knowledge on communication skills for work (achieving consensus value of 59%); and
3. Item 6: The pedagogical model will help to improve students' motivation in learning communication skills for work (achieving consensus value of 59%).

For teachers, Table 4.30 presents the summary of threshold values for perceived importance of technical communication pedagogical model items, and Table 4.31presents the summary of experts' consensus values for perceived importance of technical communication pedagogical model items.

Table 4.30

Summary of threshold values for perceived importance of technical communication pedagogical model (for teachers).

Expert	Item						
	1	**2**	**3**	**4**	**5**	**6**	**7**
1	0.2	0.1	0.1	0.1	0.2	0.2	0.2
2	0.2	0.2	0.2	0.1	0.2	0.2	0.2
3	0.2	0.2	0.2	0.1	0.1	0.1	0.1
4	0.1	0.2	0.2	0.1	0.2	0.2	0.2
5	**0.4**	0.1	**0.4**	0.2	**0.4**	0.1	0.1
6	0.1	0.1	0.1	0.2	0.2	0.2	0.1
7	0.1	0.1	0.1	0.2	**0.4**	0.1	0.1
8	0.1	0.1	0.1	0.1	0.1	0.1	0.1
9	0.1	0.1	0.1	0.2	0.1	0.1	0.1
10	0.1	0.2	0.2	0.1	0.2	0.2	0.2
11	0.1	0.1	0.1	0.2	0.1	0.1	0.1
12	0.2	0.2	0.2	0.1	0.2	0.2	0.2
13	0.2	0.2	0.2	0.1	0.2	0.1	0.2
14	0.2	0.2	0.2	0.1	0.2	0.2	0.2
15	0.1	0.1	0.1	0.2	0.1	0.1	0.1
16	0.1	0.1	0.1	0.1	0.2	0.1	0.1
17	0.1	0.1	0.1	0.2	0.1	0.1	0.1
***d* value for each item**	2.588	2.516	2.768	2.516	3.235	2.516	2.516
Total of *d* value	18.654/(17X7)						
***d* value for construct**	0.157						

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted

*items achieving threshold value ≥0.02 are rejected

Table 4.31

Summary of experts' consensus values for perceived importance of technical communication pedagogical model (for teachers).

	Item						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Total of accepted items	16	17	16	17	15	17	17
Consensus value (%)	94%	100%	94%	100%	88%	100%	100%

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted

*items achieving consensus value <75% are rejected

Table 4.32

Summary of accepted items for perceived importance of technical communication pedagogical model (for teachers).

Items	Perceived Importance of Technical Communication Pedagogical Model (for Teachers)	Fuzzy Evaluation	Defuzzification	Ranking
1	The pedagogical model will help to improve teachers' understanding of relevant communication skills to the current industry.	(7.80, 11.20, 14.60)	0.659	4
2	The pedagogical model will help to improve teachers' understanding of important communication skills to be integrated in teaching.	(8.20, 11.60, 15.00)	0.682	2
3	The pedagogical model will help to improve teachers' understanding in organizing relevant teaching and learning activities in classroom.	(8.00, 11.40, 14.80)	0.671	3
4	The pedagogical model will help to guide teacher in organizing teaching objectives in teaching communication skills that are relevant to the current industry.	(8.80, 12.20, 15.60)	0.718	1
5	The pedagogical model will help to guide teacher in organizing the relevant content of learning in teaching communication skills that are relevant to the current industry.	(8.20, 11.60, 15.00)	0.682	2
6	The pedagogical model will help to guide teacher in selecting appropriate teaching delivery method in teaching communication skills that are relevant to the current industry.	(8.20, 11.60, 15.00)	0.682	2
7	The pedagogical model will help to guide teacher in selecting appropriate assessments in teaching communication skills that are relevant to the current industry.	(8.20, 11.60, 15.00)	0.682	2

Based on the result in Table 4.32, the experts agreed that:

1. the pedagogical model will help to guide teacher in organizing teaching objectives in teaching communication skills that are relevant to the current industry, with defuzzification value of 0.718, and ranking of 1;

2. the pedagogical model will help to improve teachers' understanding of important communication skills to be integrated in teaching, with defuzzification value of 0.682, and ranking of 2;
3. the pedagogical model will help to guide teacher in organizing the relevant content of learning in teaching communication skills that are relevant to the current industry, with defuzzification value of 0.682, and ranking of 2;
4. the pedagogical model will help to guide teacher in selecting appropriate teaching delivery method in teaching communication skills that are relevant to the current industry, with defuzzification value of 0.682, and ranking of 2;
5. the pedagogical model will help to guide teacher in selecting appropriate assessments in teaching communication skills that are relevant to the current industry, with defuzzification value of 0.682, and ranking of 2;
6. the pedagogical model will help to improve teachers' understanding in organizing relevant teaching and learning activities in classroom with defuzzification value of 0.671, and ranking of 3; and
7. the pedagogical model will help to improve teachers' understanding of relevant communication skills to the current industry, with defuzzification value of 0.659, and ranking of 4.

Perceived importance of English language proficiency to Technical Communication Pedagogical Model. In this section, the fuzzy delphi results for perceived importance of English Language Proficiency to Technical Communication Pedagogical Model are presented. Table 4.33 presents the summary of threshold values for perceived importance of technical communication pedagogical model items, and Table 4.34 presents the summary of experts' consensus values for perceived importance of technical communication pedagogical model items.

Table 4.33

Summary of threshold values for perceived importance of English language proficiency to technical communication pedagogical model.

Expert	**Item**																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	**0.3**	**0.3**	0.1	0.1	0.0	0.0	0.0
2	0.1	0.0	**0.3**	0.0	**0.0**	0.0	**0.3**	**0.3**	**0.3**	0.0	0.1	0.0	**0.3**	0.1	**0.3**	**0.3**	**0.3**
3	0.2	0.0	0.0	**0.3**	**0.3**	0.0	**0.3**	0.1	**0.4**	0.0	0.1	0.0	0.1	**0.3**	**0.3**	0.0	**0.3**
4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	**0.3**	0.1	0.0	0.1	0.0	0.1	0.1	**0.3**	0.0	0.0
5	0.1	0.0	0.0	**0.3**	**0.3**	0.0	0.0	**0.3**	0.1	0.0	**0.3**	0.0	**0.3**	0.1	0.0	0.0	0.0
6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	**0.3**	0.1	0.0	0.0	0.0
7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	**0.3**	0.1	0.0	0.1	0.1	0.0	0.0	0.0
8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0
9	0.2	**0.3**	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0
10	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.4**	**0.3**	**0.3**	**0.3**
11	**0.5**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	0.1	0.1	**0.3**	**0.4**	**0.6**	**0.7**	**0.6**	0.0	0.0	**0.6**
12	**0.4**	**0.3**	0.0	0.0	**0.6**	**0.3**	**0.3**	0.1	0.1	0.0	**0.3**	**0.3**	0.1	**0.6**	**0.3**	**0.3**	**0.3**
13	0.1	0.0	0.0	**0.3**	0.0	0.0	0.0	**0.4**	**0.3**	0.0	**0.4**	**0.3**	0.1	0.1	0.0	0.0	0.0
14	0.1	0.0	**0.3**	0.0	0.0	0.0	**0.3**	0.1	0.1	0.0	**0.3**	**0.3**	**0.3**	**0.4**	**0.3**	**0.3**	**0.3**
15	0.2	**0.3**	**0.3**	0.0	**0.3**	0.0	0.0	0.1	**0.3**	**0.3**	0.1	0.0	0.1	0.1	0.0	0.0	0.0
16	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0
17	0.2	**0.3**	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0
***d* value for each item**	3.486	2.336	2.157	1.833	2.839	1.222	2.383	2.013	2.013	1.222	2.516	2.300	2.516	2.732	1.833	1.617	2.336
Total of *d* value	37.355/(17X11)=0.199																
***d* value for construct**	0.199																

*condition 1 has been fulfilled; items achieving threshold value ≤0.02 are accepted
*items achieving threshold value ≥0.02 are rejected

Table 4.34

Summary of experts' consensus values for importance of English language proficiency to technical communication pedagogical model.

	Item																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Total of accepted items	14	**10**	**12**	**12**	**10**	14	**11**	**12**	**12**	13	**10**	**11**	**11**	**12**	**11**	13	**11**
Consensus value (%)	82%	**59%**	**71%**	**71%**	**59%**	82%	**65%**	**71%**	**71%**	76%	**59%**	**65%**	**65%**	**71%**	**65%**	76%	**65%**

*condition 2 has been fulfilled; items achieving consensus value >75% are accepted

*items achieving consensus value <75% are rejected

Table 4.35

Summary of accepted items for importance of English language proficiency to technical communication pedagogical model.

Items	Importance of English Language Proficiency to Technical Communication Pedagogical Model	Fuzzy Evaluation	Defuzzification	Ranking
1	The ability to apply accurate grammar in a conversation is important to the development of communication skills for work.	(5.40, 8.80, 12.20)	0.518	3
6	The ability to construct accurate sentence structure in writing is important to the development of communication skills for work.	(6.80, 10.20, 13.60)	0.600	2
10	The ability to apply appropriate verbal communication strategy in a conversation is important to the development of communication skills for work.	(6.80, 10.20, 13.60)	0.600	2
16	The ability comprehend information in a text in English language is important to the development of communication skills for work.	(7.20, 10.60, 14.00)	0.624	1

Based on the result in Table 4.35, the experts agreed that:

1. the ability comprehend information in a text in English language is important to the development of communication skills for work, with defuzzification value of 0.624, and ranking of 1;
2. the ability to construct accurate sentence structure in writing is important to the development of communication skills for work, with defuzzification value of 0.600, and ranking of 2;

3. the ability to apply appropriate verbal communication strategy in a conversation is important to the development of communication skills for work, with defuzzification value of 0.600, and ranking of 2; and
4. the ability to apply accurate grammar in a conversation is important to the development of communication skills for work, with defuzzification value of 0.518, and ranking of 4.

Meanwhile, the items rejected by experts are:

1. Item 2: The ability to construct accurate sentence structure in a conversation is important to the development of communication skills for work (achieving consensus value of 59%);
2. Item 3: The ability to apply accurate vocabulary in a conversation is important to the development of communication skills for work (achieving consensus value of 71%);
3. Item 4: The ability to apply accurate grammar in writing is important to the development of communication skills for work (achieving consensus value of 71%);
4. Item 5: The ability to communicate with accurate pronunciation in English is important to the development of communication skills for work (achieving consensus value of 59%);
5. Item 7: The ability to use accurate vocabulary in writing is important to the development of communication skills for work (achieving consensus value of 65%);
6. Item 8: The ability to apply accurate spelling in writing is important to the development of communication skills for work (achieving consensus value of 71%);

7. Item 9: The ability to apply non-verbal cues in a conversation is important to the development of communication skills for work (achieving consensus value of 71%);
8. Item 11: The ability to construct content of conversation that suits listener's background is important to the development of communication skills for work (achieving consensus value of 59%);
9. Item 12: The ability to conduct conversation that suits listener's background is important to the development of communication skills for work (achieving consensus value of 65%);
10. Item 13: The ability to comprehend the content of a conversation in English language is important to the development of communication skills for work (achieving consensus value of 65%);
11. Item 14: The ability to infer the information from a conversation in English language is important to the development of communication skills for work (achieving consensus value of 71%);
12. Item 15: The ability to locate information in a text in English language is important to the development of communication skills for work (achieving consensus value of 65%); and
13. Item 17: The ability to synthesize information in a text in English language is important to the development of communication skills for work (achieving consensus value of 65%).

Conclusion

Based on the analysis of FDM, the accepted items are used for the next phase; survey for lecturers in Malaysian Vocational Colleges. Table 4.36 presents a summary of accepted items according to different domains.

Table 4.36

Summary of accepted items.

No.	Items	Objective/Focus of Learning	Fuzzy Evaluation	Defuzzification	Ranking
Objective					
1.	5	The objective/focus of technical communication pedagogical model is to provide work-related communicative experiences for students.	(8.80, 12.20, 15.60)	0.718	1
2.	7	The objective/focus of technical communication pedagogical model is to expose students with authentic communicative experiences in the real settings of the industry.	(8.80, 12.20, 15.60)	0.718	1
3.	2	The objective/focus of technical communication pedagogical model is to develop written communication skills that are relevant to the industry.	(8.60, 12.00, 15.40)	0.706	2
4.	3	The objective/focus of technical communication pedagogical model is to develop interpersonal skills that are relevant to the industry.	(8.60, 12.00, 15.40)	0.706	2
5.	4	The objective/focus of technical communication pedagogical model is to develop researching skills that are relevant to the industry	(8.40, 11.80, 15.20)	0.694	3
6.	6	The objective/focus of technical communication pedagogical model is to guide teaching and learning for communication skills in technical field.	(8.40, 11.80, 15.20)	0.694	3
7.	1	The objective/focus of technical communication pedagogical model is to develop oral	(7.80, 11.20, 14.60)	0.659	4

		communication skills that are relevant to the industry.			
Content of Learning: Oral Technical Communication Skills					
1.	8	The ability to deliver a speech to audience is important to be emphasized in the content of learning.	(8.60, 12.00, 15.40)	0.706	1
2.	6	The ability to plan and prepare visual aids (for larger audience) is important to be emphasized in the content of learning.	(8.40, 11.80, 15.20)	0.694	2
3.	7	The ability to plan an introduction and conclusion of oral presentations is important to be emphasized in the content of learning.	(8.20, 11.60, 15.00)	0.682	3
4.	3	The ability to define communication purpose is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	4
5.	5	The ability to plan and develop the content of oral presentations is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	4
6.	1	The ability to find a situation that suits an oral presentation is important to be emphasized in the content of learning.	(7.80, 11.20, 14.60)	0.659	5
7.	2	The ability to define audience is important to be emphasized in the content of learning.	(7.80, 11.20, 14.60)	0.659	5
8.	9	The ability to chair a meeting is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	6
Content of Learning: Written Technical Communication Skills					
1.	1	The ability to produce business letters is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	1
2.	10	The ability to produce technical journalism is important to be emphasized in the content of learning.	(5.80, 9.20, 12.60)	0.541	2

Content of Learning: Interpersonal Skills					
1.	1	The ability to communicate effectively with co-workers and administrators is important to be emphasized in the content of learning.	(9.00, 12.40, 15.80)	0.729	1
2.	4	The ability to establish professional relationships with customers and co-workers is important to be emphasized in the content of learning.	(8.80, 12.20, 15.60)	0.718	2
3.	9	The ability to positively handle conflicts within groups is important to be emphasized in the content of learning.	(8.80, 12.20, 15.60)	0.718	2
4.	10	The leadership skills are important to be emphasized in the content of learning.	(8.80, 12.20, 15.60)	0.718	2
5.	2	The ability to effectively give instructions is important to be emphasized in the content of learning.	(8.60, 12.00, 15.40)	0.706	3
6.	3	The ability to give constructive feedbacks is important to be emphasized in the content of learning.	(8.60, 12.00, 15.40)	0.706	3
7.	8	The multicultural awareness is important to be emphasized in the content of learning.	(8.00, 11.40, 14.80)	0.671	4
8.	5	The ability to share information in small group settings is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	5
Content of Learning: Researching Skills					
1.	5	The knowledge on how to operate technological tools to improve communication is important to be emphasized in the content of learning.	(8.40, 11.80, 15.20)	0.694	1
2.	4	The ability to distinguish main ideas from supporting details is important to be	(8.00, 11.40, 14.80)	0.671	2

		emphasized in the content of learning.			
3.	1	The ability to retrieve relevant information is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	3
4.	2	The ability to gather and organize relevant information is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	3
5.	6	An awareness of how technological tools help to promote social-interactions and collaboration at work is important to be emphasized in the content of learning.	(7.60, 11.00, 14.40)	0.647	3
6.	3	The ability to comprehend job-related journal and technical materials is important to be emphasized in the content of learning.	(7.20, 10.60, 14.00)	0.624	4
		Method of Delivery			
1.	3	Collaborative learning activity is a relevant method of delivery to develop students' technical communication skills.	(8.80, 12.20, 15.60)	0.718	1
2.	4	Field training is a relevant method of delivery to develop students' technical communication skills.	(8.60, 12.00, 15.40)	0.706	2
3.	11	Contextualized learning activity (which is conducted in an authentic working environment) is a relevant method of delivery to develop students' technical communication skills.	(8.40, 11.80, 15.20)	0.694	3
4.	2	Practical tutorial is a relevant method of delivery to develop students' technical communication skills.	(8.00, 11.40, 14.80)	0.671	4

5.	9	Expert feedback from technical field on the content and task for learning is a relevant method of delivery to develop students' technical communication skills.	(7.80, 11.20, 14.60)	0.659	5
6.	10	Communication across curriculum (integrates technical communication skills across technical subjects) is a relevant method of delivery to develop students' technical communication skills.	(7.80, 11.20, 14.60)	0.659	5
7.	8	Communication module which introduces technical communication across technical subjects is a relevant method of delivery to develop students' technical communication skills.	(7.00, 10.40, 13.80)	0.612	6
8.	5	Online learning activity is a relevant method of delivery to develop students' technical communication skills.	(6.00, 9.40, 12.80)	0.553	7
		Assessment Method			
1.	7	Observation on students' communicative experiences in group activities / team work projects are relevant to help assess students' technical communication skills.	(8.60, 12.00, 15.40)	0.706	1
2.	6	Observation on students' communicative experiences during field work training are relevant to help assess students' technical communication skills.	(8.40, 11.80, 15.20)	0.694	2
3.	2	Oral presentations are relevant to help assess students' technical communication skills.	(8.00, 11.40, 14.80)	0.671	3

4.	4	Writing technical document tasks are relevant to help assess students' technical communication skills.	(8.00, 14.80)	11.40,	0.671	3
5.	8	Students' responses in online forum discussion are relevant to be observed to help assess students' technical communication skills.	(7.00, 13.80)	10.40,	0.612	4
6.	5	Terminology exams are relevant to help assess students' technical communication skills.	(6.00, 12.80)	9.40,	0.553	5
Perceived Importance of Technical Communication Pedagogical Model (for Students)						
1.	7	The pedagogical model will help to encourage students to practice communication skills for work during instruction hour.	(8.20, 15.00)	11.60,	0.682	1
2.	8	The pedagogical model will help to encourage students to practice communication skills for work in an authentic learning environment.	(8.20, 15.00)	11.60,	0.682	1
3.	5	The pedagogical model is appropriate to students' prior communicative experiences during field work.	(8.00, 14.80)	11.40,	0.671	2
4.	1	The pedagogical model considers students' prior knowledge in developing communication skills for work.	(7.80, 14.60)	11.20,	0.659	3
5.	4	The pedagogical model is appropriate to students' prior communicative experiences in classroom.	(7.80, 14.60)	11.20,	0.659	3
Perceived Importance of Technical Communication Pedagogical Model (for Teachers)						
1.	4	The pedagogical model will help to guide teacher in organizing teaching objectives in teaching communication skills that	(8.80, 15.60)	12.20,	0.718	1

		are relevant to the current industry.			
2.	2	The pedagogical model will help to improve teachers' understanding of important communication skills to be integrated in teaching.	(8.20, 11.60, 15.00)	0.682	2
3.	5	The pedagogical model will help to guide teacher in organizing the relevant content of learning in teaching communication skills that are relevant to the current industry.	(8.20, 11.60, 15.00)	0.682	2
4.	6	The pedagogical model will help to guide teacher in selecting appropriate teaching delivery method in teaching communication skills that are relevant to the current industry.	(8.20, 11.60, 15.00)	0.682	2
5.	7	The pedagogical model will help to guide teacher in selecting appropriate assessments in teaching communication skills that are relevant to the current industry.	(8.20, 11.60, 15.00)	0.682	2
6.	3	The pedagogical model will help to improve teachers' understanding in organizing relevant teaching and learning activities in classroom.	(8.00, 11.40, 14.80)	0.671	3
7.	1	The pedagogical model will help to improve teachers' understanding of relevant communication skills to the current industry.	(7.80, 11.20, 14.60)	0.659	4
Perceived Importance of English Language Proficiency to Technical Communication Pedagogical Model					
1.	16	The ability comprehend information in a text in English language is important to the development of	(5.40, 8.80, 12.20)	0.624	1

		communication skills for work.			
2.	6	The ability to construct accurate sentence structure in writing is important to the development of communication skills for work.	(6.80, 10.20, 13.60)	0.600	2
3.	10	The ability to apply appropriate verbal communication strategy in a conversation is important to the development of communication skills for work.	(6.80, 10.20, 13.60)	0.600	2
4.	1	The ability to apply accurate grammar in a conversation is important to the development of communication skills for work.	(7.20, 10.60, 14.00)	0.518	3

Based on the above table (Table 4.36), there are: a) six accepted items for Objective/Focus of Learning, b) eight accepted items for Content of Learning: Oral Technical Communication Skills, c) two accepted items for Content of Learning: Written Technical Communication Skills, d) eight accepted items for Content of Learning: Interpersonal Skills, e) six accepted items for Content of Learning: Researching Skills, f) eight accepted items for Method of Delivery, g) six accepted items for Assessment Method, h) five accepted items for Perceived Importance of Technical Communication Pedagogical Model (for Students), i) seven accepted items for Perceived Importance of Technical Communication Pedagogical Model (for Teachers), and j) four accepted items for Importance of English Language Proficiency to Technical Communication Pedagogical Model.

CHAPTER 5

EXPLORATORY FACTOR ANALYSIS (EFA) IN PILOT STUDY

Introduction

In this chapter, the results of EFA in the pilot study are presented. The first section of this chapter explains the demographic of respondents. This is followed by EFA results for all constructs and reliability analysis results.

A pilot study has been conducted on 100 English language instructors in Vocational Colleges in Peninsula Malaysia. Previoiusly, it is stated that the overall number of English language instructors in all Vocational Colleges across Malaysia is 435, and only 205 instructors were selected as the research participants for the current study, based on Krejcie and Morgan's (1970) sample size determination for research table. For the purpose of the pilot study, 100 English language instructors were initially selected to answer the developed questionnaire, before the real data collection process was conducted. Because of the small population of English language instructors in Malaysian Vocational Colleges, the pilot study has included instructors from all four zones (Northern, Central, Southern, and East Coast Zone) in Peninsula Malaysia. The questionnaires were administered face-to-face, starting from Northern, Central, Southern to Eastern Zone. This is to ensure the return rate is high (Chua, 2012) and to get immediate feedbacks on the instrument used for this study. Once the data collection for this phase is completed, the data was analysed using SPSS.

Demographic of Respondents for Pilot Study.

The demographic information of respondents for the pilot study, according to their zone, gender, age and working experience, is presented in Table 5.1 below.

Table 5.1

Demography of pilot study respondents.

General profile	Frequency	Percentage (%)
Zone		
Northern	8	8
Central	23	23
Southern	38	38
East Coast	31	31
Total	**100**	**100**
Gender		
Male	10	10
Female	90	90
Total	**100**	**100**
Age		
20-29 years old	23	23
30-39 years old	47	47
40-49 years old	28	28
50 years old and above	2	2
Total	**100**	**100**
Working Experience		
Less than 5 years	21	21
6-10 years	23	23
11-15 years	34	34
16-20 years	15	15
21-25 years	6	6
26-30 years	0	0

More than 31 years	1	1
Total	**100**	**100**

Majority of the respondents for the pilot study were from Southern Zone, with total of 38%, and is followed by East Coast (31%), Central (23%) and Northern (8%). From 100 respondents, 90% (N=90) respondents were female and only 10% were male (N=10). In addition, majority of the respondents were between 30 to 39 years old (47%). 28% of the respondents aged between 40 to 49 years old, 23% aged between 20 to 29 years old, and only 2% aged 50 years old and above. On the other hand, from 100 respondents, the majority of them have working experience between 11 to 15 years (34%). This is followed by respondents with working experience between six to 10 years (23%), less than five years (21%), between 16 to 20 years (15%), between 21 to 25 years (6%), and with more than 31 years of experience (1%).

Exploratory Factor Analysis for Objective Construct.

For items in Objective construct**,** the EFA with promax rotation was performed. The correlation matrix in Table 5.2 indicated that all items have achieved correlation value between 0.327 to 0.695 between items, indicating acceptable correlation values.

Table 5.2

Correlation matrix for items in Objective construct.

		OBJ1	OBJ2	OBJ3	OBJ4	OBJ5	OBJ6	OBJ7
Correlation	OBJ1	1.000	0.580	0.628	0.410	0.620	0.541	0.522
	OBJ2	0.580	1.000	0.693	0.530	0.432	0.544	0.609
	OBJ3	0.628	0.693	1.000	0.424	0.571	0.650	0.695
	OBJ4	0.410	0.530	0.424	1.000	0.327	0.486	0.379

	OBJ5	0.620	0.432	0.571	0.327	1.000	0.645	0.674
	OBJ6	0.541	0.544	0.650	0.486	0.645	1.000	0.624
	OBJ7	0.522	0.609	0.695	0.379	0.674	0.624	1.000
Sig. (1-tailed)	OBJ1		0.000	0.000	0.000	0.000	0.000	0.000
	OBJ2	0.000		0.000	0.000	0.000	0.000	0.000
	OBJ3	0.000	0.000		0.000	0.000	0.000	0.000
	OBJ4	0.000	0.000	0.000		0.000	0.000	0.000
	OBJ5	0.000	0.000	0.000	0.000		0.000	0.000
	OBJ6	0.000	0.000	0.000	0.000	0.000		0.000
	OBJ7	0.000	0.000	0.000	0.000	0.000	0.000	

a. Determinant = .018

In addition, the value of KMO measure for sampling adequacy was 0.861 (>0.5) and Bartlett's test of sphericity was significant (p<0.001) as presented in Table 5.3 below. Thus, it is relevant to state that the factor analysis is appropriate to be conducted for these data.

Table 5.3

The result of KMO and Bartlett's test for items in Objectiveconstruct.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.861
Bartlett's Test of Sphericity	Approx. Chi-Square	384.431
	df	21
	Sig.	0.000

In the next analysis, based on the Kaiser's (1960) criterion (eigenvalue bigger than 1), all seven items yielded one factor, which explained 61.989% of the total variance, as presented in Table 5.4. This total value is acceptable as it is higher than 50% cut-off value (Chinna, 2009).

Table 5.4
The result of total variance explained for Objective construct.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.339	61.989	61.989	3.922	56.031	56.031
2	0.788	11.258	73.247			
3	0.550	7.863	81.110			
4	0.499	7.124	88.234			
5	0.354	5.061	93.296			
6	0.259	3.706	97.002			
7	0.210	2.998	100.000			

*Extraction Method: Principal Axis Factoring

In addition, the scree plot below (Figure 5.1) indicated that only one factor solution should be considered as the pronounced inflection point was at factor two.

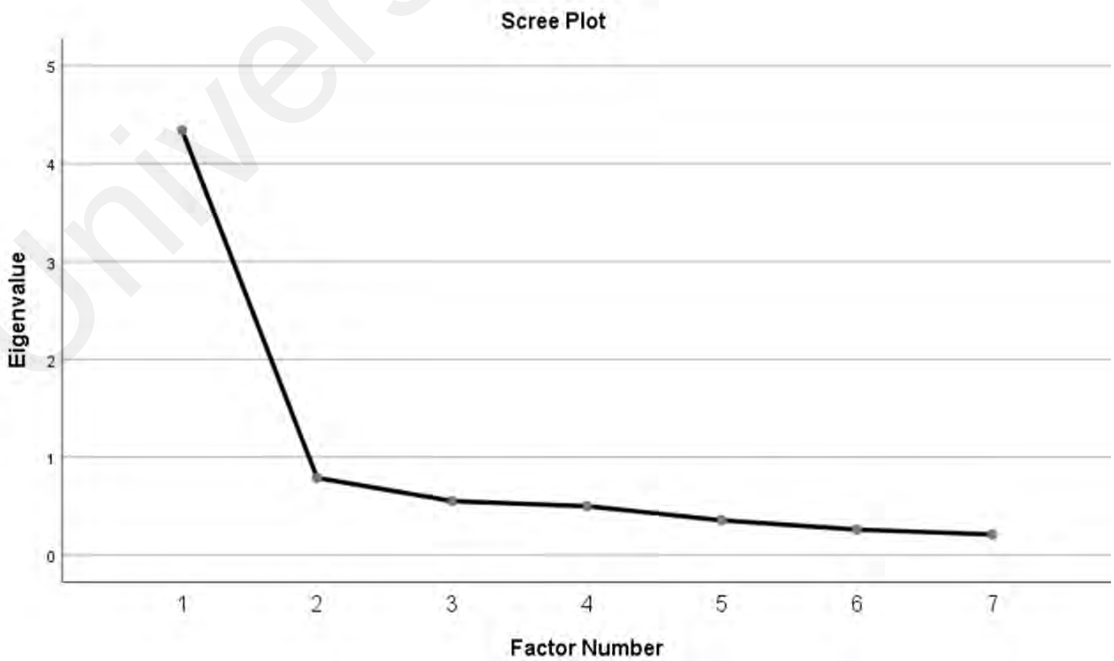


Figure 5.1 Scree plot for Objective construct

Thus, both results of Kaiser's (1960) criterion (eigenvalue bigger than 1) and scree plot indicated that a one-factor solution with seven items was ideal for these data.

Exploratory Factor Analysis for Content of Learning Construct.

For items in Content of Learning construct**,** the EFA with promax rotation was performed. Initially, the results of the correlation matrix indicated that were six items (OTC1, OTC2, OTC7, OTC8, WTC2 and RS3) achieved a correlation value below 0.3. Hence, these items were omitted as suggested by Yong and Pearce (2013). After deletion, all items have achieved correlation value between 0.307 to 0.804 between items, indicating acceptable correlation values as presented in Table 5.5 below.

Table 5.5

Correlation matrix for items in Content of Learning construct.

		OTC3	OTC4	OTC5	OTC6	WTC1	IS1	IS2	IS3	IS4	IS5	IS6	IS7	IS8	RS1	RS2	RS4	RS5	RS6
Correlation	**OTC3**	1.000	0.450	0.454	0.479	0.342	0.457	0.519	0.502	0.481	0.503	0.467	0.477	0.491	0.375	0.461	0.338	0.341	0.462
	OTC4	0.450	1.000	0.656	0.439	0.436	0.350	0.440	0.499	0.436	0.393	0.401	0.386	0.426	0.445	0.330	0.366	0.368	0.311
	OTC5	0.454	0.656	1.000	0.404	0.327	0.320	0.307	0.447	0.402	0.352	0.463	0.351	0.351	0.474	0.388	0.526	0.330	0.321
	OTC6	0.479	0.439	0.404	1.000	0.444	0.389	0.531	0.532	0.315	0.541	0.357	0.487	0.512	0.488	0.567	0.308	0.343	0.493
	WTC1	0.342	0.436	0.327	0.444	1.000	0.500	0.496	0.513	0.438	0.462	0.459	0.493	0.512	0.402	0.465	0.301	0.360	0.379
	IS1	0.457	0.350	0.320	0.389	0.500	1.000	0.707	0.669	0.717	0.541	0.584	0.527	0.563	0.508	0.438	0.343	0.414	0.361
	IS2	0.519	0.440	0.307	0.531	0.496	0.707	1.000	0.804	0.705	0.764	0.598	0.735	0.700	0.604	0.625	0.435	0.438	0.422
	IS3	0.502	0.499	0.447	0.532	0.513	0.669	0.804	1.000	0.705	0.704	0.657	0.703	0.718	0.655	0.607	0.494	0.380	0.451
	IS4	0.481	0.436	0.402	0.315	0.438	0.717	0.705	0.705	1.000	0.557	0.621	0.570	0.551	0.438	0.399	0.384	0.432	0.339
	IS5	0.503	0.393	0.352	0.541	0.462	0.541	0.764	0.704	0.557	1.000	0.567	0.763	0.604	0.524	0.626	0.319	0.362	0.469
	IS6	0.467	0.401	0.463	0.357	0.459	0.584	0.598	0.657	0.621	0.567	1.000	0.704	0.594	0.462	0.485	0.498	0.504	0.521
	IS7	0.477	0.386	0.351	0.487	0.493	0.527	0.735	0.703	0.570	0.763	0.704	1.000	0.691	0.549	0.676	0.403	0.432	0.525
	IS8	0.491	0.426	0.351	0.512	0.512	0.563	0.700	0.718	0.551	0.604	0.594	0.691	1.000	0.608	0.659	0.430	0.366	0.626
	RS1	0.375	0.445	0.474	0.488	0.402	0.508	0.604	0.655	0.438	0.524	0.462	0.549	0.608	1.000	0.739	0.588	0.448	0.523
	RS2	0.461	0.330	0.388	0.567	0.465	0.438	0.625	0.607	0.399	0.626	0.485	0.676	0.659	0.739	1.000	0.546	0.452	0.620
	RS4	0.338	0.366	0.526	0.308	0.301	0.343	0.435	0.494	0.384	0.319	0.498	0.403	0.430	0.588	0.546	1.000	0.505	0.513
	RS5	0.341	0.368	0.330	0.343	0.360	0.414	0.438	0.380	0.432	0.362	0.504	0.432	0.366	0.448	0.452	0.505	1.000	0.516
	RS6	0.462	0.311	0.321	0.493	0.379	0.361	0.422	0.451	0.339	0.469	0.521	0.525	0.626	0.523	0.620	0.513	0.516	1.000
Sig. (1-tailed)	**OTC3**		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	OTC4	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	OTC5	0.000	0.000		0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	OTC6	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	WTC1	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	IS1	0.000	0.000	0.001	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

IS2	0.000	0.000	0.001	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IS3	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IS4	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IS5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
IS6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
IS7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
IS8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
RS1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
RS2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
RS4	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000		0.000	0.000
RS5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
RS6	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

a. Determinant = 1.25E-006

In addition, the value of KMO measure for sampling adequacy was 0.920 (>0.5) and Bartlett's test of sphericity was significant (p<0.001) as presented in Table 5.6 below. Thus, it is relevant to state that the factor analysis is appropriate to be conducted for these data.

Table 5.6

The result of KMO and Bartlett's test for items in Content of Learning construct.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.920
Bartlett's Test of Sphericity	Approx. Chi-Square	1252.957
	df	153
	Sig.	0.000

In the next analysis, based on the Kaiser's (1960) criterion (eigenvalue bigger than 1), all 18 items yielded three factors, which explained 66.252% of the total variance, as presented in Table 5.7. This total value is acceptable as it is higher than 50% cut-off value (Chinna, 2009).

Table 5.7

The result of total variance explained for Content of Learning construct.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings [a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	9.467	52.593	52.593	9.097	50.542	50.542	8.134
2	1.324	7.356	59.949	0.982	5.456	55.998	7.547
3	1.135	6.303	66.252	0.802	4.456	60.454	4.563
4	0.959	5.328	71.580				
5	0.736	4.090	75.670				
6	0.692	3.845	79.515				
7	0.581	3.225	82.741				
8	0.531	2.952	85.692				
9	0.430	2.390	88.082				

10	0.399	2.216	90.298
11	0.345	1.916	92.214
12	0.285	1.586	93.800
13	0.256	1.423	95.223
14	0.222	1.233	96.456
15	0.203	1.130	97.586
16	0.160	0.891	98.477
17	0.152	0.843	99.320
18	0.122	0.680	100.000

*Extraction Method: Principal Axis Factoring

However, the scree plot below (Figure 5.2) indicated that two solutions were possible for the data; two-factor and four-factor solution. There were two inflection points (at factor three and again at five).

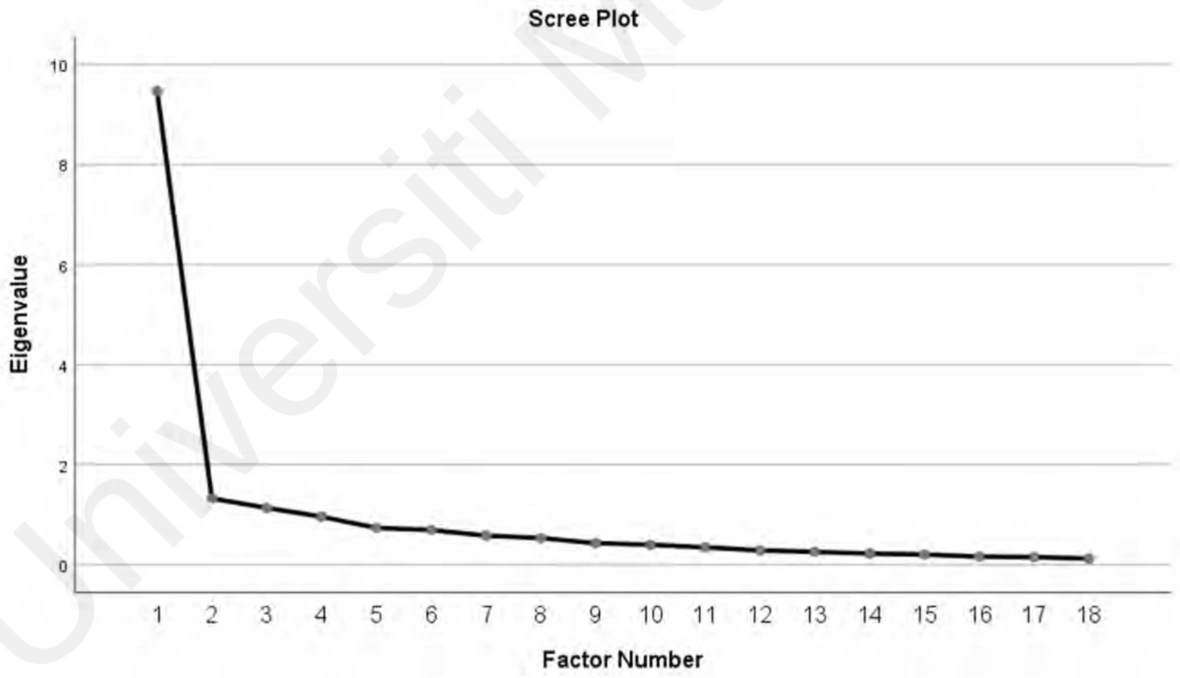


Figure 5.2 Scree plot for Content of Learning construct.

Borrowing Bloom, Gutierrez and Lambie's (2015) lenses in selecting appropriate number of factor solution, they noted the themes based on previous theories should first be identified. In this study, a two-factor solution is more relevant to reflect the components of technical communication skills. In fact, Worthington and Whittaker (2006) supported that conceptual interpretability is important in determining the number of factors to be retained because EFA is a combination of empirical and subjective approach to analyze data.

Table 5.8 summarizes the result of three-factor solution. It is found that Factor 3 only consists of two items (OTC4 and OTC5). Tabachnick and Fidell (2001) recommended that factor with less than three items should be avoided unless the loading for each item is highly correlated (above 0.7). However, the result indicated the correlation between both items was lower than 0.7. Thus, it is more appropriate to consider a two-factor solution. Again, the factor analysis was performed with two-factor retention.

Table 5.8

Pattern matrix for Content of Learning construct.

	Factor		
	1	2	3
IS4	0.951		
IS2	0.881		
IS1	0.860		
IS3	0.750		
IS5	0.638		
IS7	0.576		
IS6	0.539		
WTC1	0.405		
OTC3	Deleted due to low loading		
RS2		0.955	
RS6		0.810	
RS1		0.629	
RS4		0.520	
IS8	0.446	0.473	
OTC6		0.468	
RS5	Deleted due to low loading		
OTC5			0.884
OTC4			0.618

* Three items were omitted because of low factor loading (item OTC3 and RS5) and the cross-loading value was less than 0.15 difference from another higher loading (item IS8) (Worthington & Whittaker, 2006).

Table 5.9

The result of total variance explained for Content of Learning construct (for two-factor solution).

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	9.467	52.593	52.593	9.051	50.285	50.285	8.409
2	1.324	7.356	59.949	0.883	4.904	55.189	7.557
3	1.135	6.303	66.252				
4	0.959	5.328	71.580				
5	0.736	4.090	75.670				
6	0.692	3.845	79.515				
7	0.581	3.225	82.741				
8	0.531	2.952	85.692				
9	0.430	2.390	88.082				
10	0.399	2.216	90.298				
11	0.345	1.916	92.214				
12	0.285	1.586	93.800				
13	0.256	1.423	95.223				
14	0.222	1.233	96.456				
15	0.203	1.130	97.586				
16	0.160	0.891	98.477				
17	0.152	0.843	99.320				
18	0.122	0.680	100.000				

Based on Table 5.9, all 18 items yielded two factors, which explained 59.949% of the total variance. This total value is acceptable as it is higher than 50% cut-off value (Chinna, 2009).

Table 5.10

Pattern matrix for Content of Learning construct (for two-factor solution).

	Factor	
	1	2
IS2	0.999	
IS1	0.836	
IS4	0.820	
IS3	0.807	
IS5	0.798	
IS7	0.737	
IS8	0.593	
IS6	0.539	
WTC1	0.444	
OTC3	0.349	0.324
RS4		0.829
OTC5		0.741
RS6		0.660
RS1		0.628
RS2		0.576
RS5		0.534
OTC4		0.521
OTC6		0.421

However, one item (item OTC3) was omitted because of cross-loading values on two items were both above 0.32 (Worthington & Whittaker, 2006) as illustrated in Table 5.10. Based on the above analysis, there were two factors (named as Social Literacy Skills (Factor 1) and Oral Presentation Skills (Factor 2)) identified with 17 items. According to Cook (2002), social literacy skills refer to both interpersonal skills, and ability to identify discourse and produce technical documents for work purposes. On the other hand, oral presentation skills cover ability to research information and communicate findings to audience (Nutman, 1987). Therefore, items in Factor 1 were named as Social Literacy Skills, and items in Factor 2 were relevant to be named as Oral Presentation Skills.

Exploratory Factor Analysis for Method of Delivery Construct.

For items in Method of Delivery construct, the EFA with promax rotation was performed. Initially, the results of the correlation matrix indicated that were two items (MOD4 and MOD6) achieved a correlation value below 0.3. Hence, these items were omitted as suggested by Yong and Pearce (2013). After deletion, all items have achieved correlation value between 0.322 to 0.720 between items, indicating acceptable correlation values as presented in Table 5.11 below.

Table 5.11

Correlation matrix for items in Method of Delivery construct.

		MOD1	MOD2	MOD3	MOD5	MOD7	MOD8
Correlation	**MOD1**	1.000	0.480	0.455	0.322	0.393	0.361
	MOD2	0.480	1.000	0.549	0.403	0.496	0.525
	MOD3	0.455	0.549	1.000	0.424	0.593	0.461
	MOD5	0.322	0.403	0.424	1.000	0.537	0.554
	MOD7	0.393	0.496	0.593	0.537	1.000	0.720
	MOD8	0.361	0.525	0.461	0.554	0.720	1.000
Sig. (1-tailed)	**MOD1**		0.000	0.000	0.001	0.000	0.000
	MOD2	0.000		0.000	0.000	0.000	0.000
	MOD3	0.000	0.000		0.000	0.000	0.000
	MOD5	0.001	0.000	0.000		0.000	0.000
	MOD7	0.000	0.000	0.000	0.000		0.000
	MOD8	0.000	0.000	0.000	0.000	0.000	

a. Determinant = .084

In addition, the value of KMO measure for sampling adequacy was 0.832 (>0.5) and Bartlett's test of sphericity was significant (p<0.001) as presented in Table

5.12 below. Thus, it is relevant to state that the factor analysis is appropriate to be conducted for these data.

Table 5.12

The result of KMO and Bartlett's test for items in Method of Delivery construct.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.832
Bartlett's Test of Sphericity	Approx. Chi-Square	237.784
	df	15
	Sig.	0.000

In the next analysis, all six items yielded one factor, which explained 49.417% of the total variance (with eigenvalue bigger than 1), as presented in Table 5.13. This total value is acceptable even though it is slightly lower than 50% cut-off value. Hair et al. (2010) claims that this value is acceptable and not uncommon in social sciences.

Table 5.13

The result of total variance explained for Method of Delivery construct.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.446	57.429	57.429	2.965	49.417	49.417
2	0.807	13.458	70.887			
3	0.551	9.182	80.068			
4	0.486	8.097	88.165			
5	0.468	7.800	95.966			
6	0.242	4.034	100.000			

*Extraction Method: Principal Axis Factoring

In addition, the scree plot below (Figure 5.3) indicated that only one factor solution should be considered as the pronounced inflection point was at factor two.

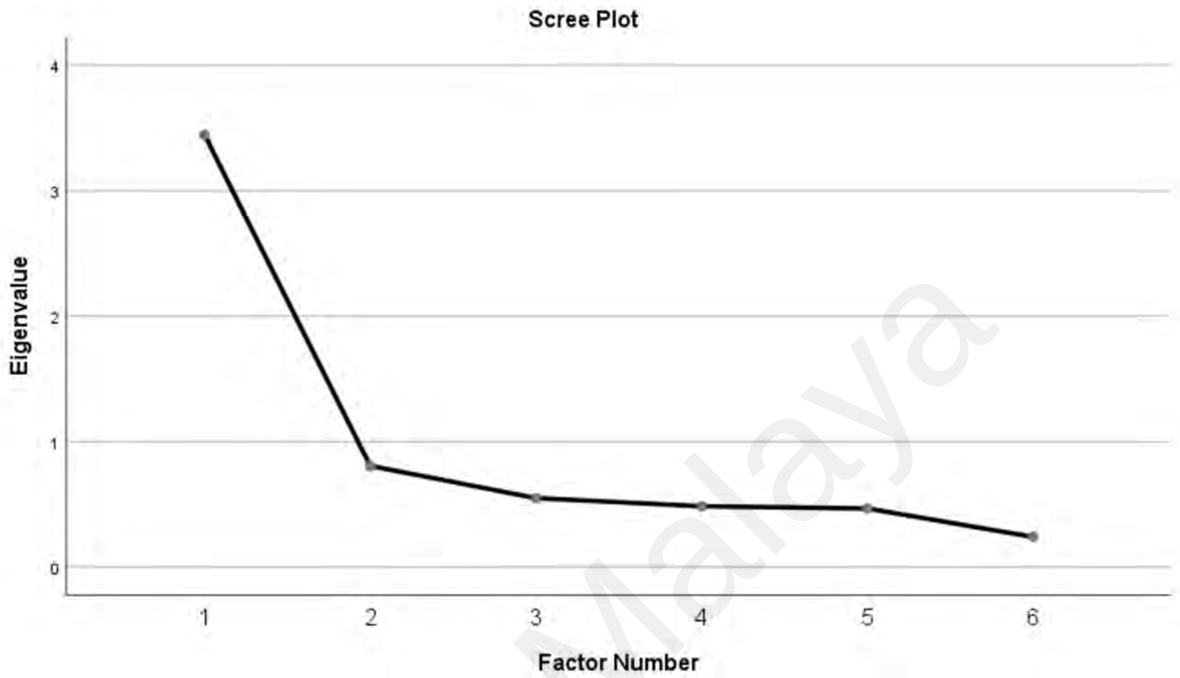


Figure 5.3 Scree plot for Method of Delivery construct.

Thus, both results of Kaiser's (1960) criterion (eigenvalue bigger than 1) and scree plot indicated that a one-factor solution with six items was ideal for these data.

Exploratory Factor Analysis for Assessment Method Construct.

For items in Assessment Method construct, the EFA with promax rotation was performed. Initially, the results of the correlation matrix indicated that one item (AS3) achieved a correlation value below 0.3. Hence, this item was omitted as suggested by Yong and Pearce (2013). After deletion, all items have achieved correlation value between 0.300 to 0.600 between items, indicating acceptable correlation values as presented in Table 5.14 below.

Table 5.14

Correlation matrix for items in Assessment Method construct.

		AS1	AS2	AS4	AS5	AS6
Correlation	**AS1**	1.000	0.568	0.600	0.579	0.439
	AS2	0.568	1.000	0.539	0.449	0.300
	AS4	0.600	0.539	1.000	0.531	0.458
	AS5	0.579	0.449	0.531	1.000	0.473
	AS6	0.439	0.300	0.458	0.473	1.000
Sig. (1-tailed)	**AS1**		0.000	0.000	0.000	0.000
	AS2	0.000		0.000	0.000	0.001
	AS4	0.000	0.000		0.000	0.000
	AS5	0.000	0.000	0.000		0.000
	AS6	0.000	0.001	0.000	0.000	

a. Determinant = .168

In addition, the value of KMO measure for sampling adequacy was 0.837 (>0.5) and Bartlett's test of sphericity was significant (p<0.001) as presented in Table 5.15 below. Thus, it is relevant to state that the factor analysis is appropriate to be conducted for these data.

Table 5.15

The result of KMO and Bartlett's test for items in Assessment Method construct.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.837
Bartlett's Test of Sphericity	Approx. Chi-Square	172.139
	df	10
	Sig.	0.000

In the next analysis, based on the Kaiser's (1960) criterion (eigenvalue bigger than 1), all five items yielded one factor, which explained 50.268% of the total variance, as presented in Table 5.16. This total value is acceptable as it is higher than 50% cut-off value (Chinna, 2009).

Table 5.16

The result of total variance explained for Assessment Method construct.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.989	59.776	59.776	2.513	50.268	50.268
2	0.725	14.490	74.266			
3	0.488	9.762	84.028			
4	0.422	8.433	92.461			
5	0.377	7.539	100.000			

*Extraction Method: Principal Axis Factoring

In addition, the scree plot below (Figure 5.4) indicated that only one factor solution should be considered as the pronounced inflection point was at factor two.

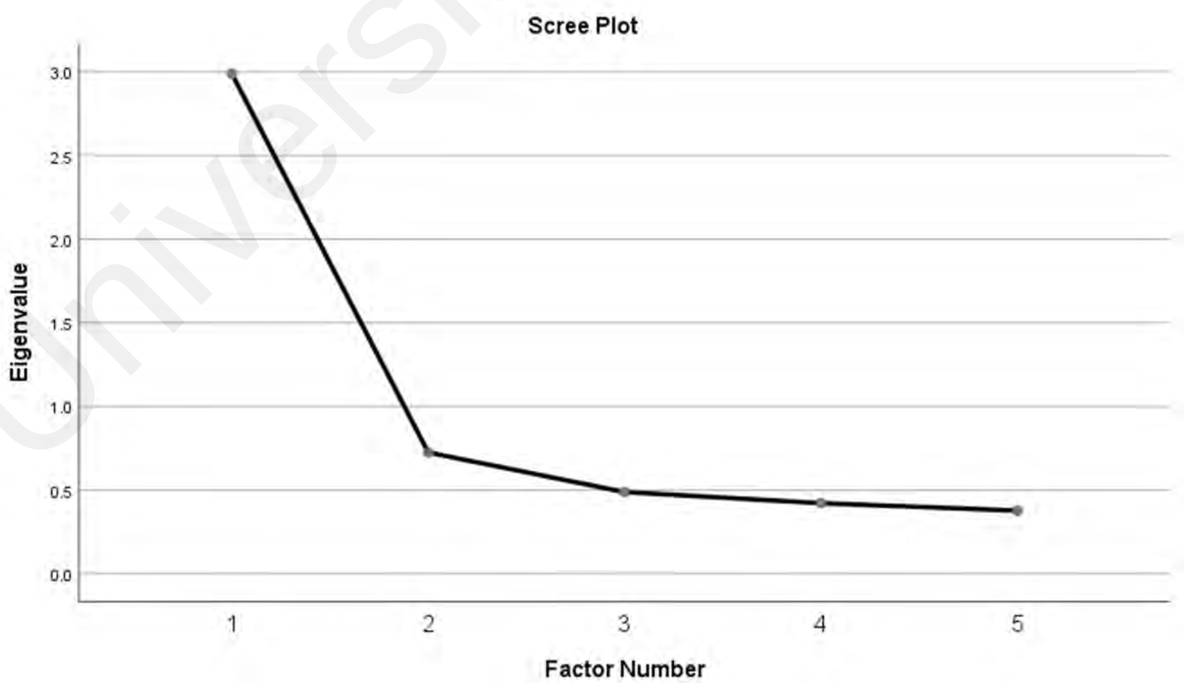


Figure 5.4 Scree plot for Assessment Method construct.

Thus, both results of Kaiser's (1960) criterion (eigenvalue bigger than 1) and scree plot indicated that a one-factor solution with five items was ideal for these data.

Exploratory Factor Analysis for Perceived Importance Technical Communication Model Construct.

For items in Importance of Technical Communication Pedagogical Model construct**,** the EFA with promax rotation was performed. The correlation matrix in Table 5.17 indicated that all items have achieved correlation value between 0.326 to 0.792 between items, indicating acceptable correlation values.

Table 5.17

Correlation matrix for items in for Importance of Technical Communication Pedagogical Modelconstruct.

		IOTCS1	IOTCS2	IOTCS3	IOTCS4	IOTCS5	IOTCT1	IOTCT2	IOTCT3	IOTCT4	IOTCT5	IOTCT6	IOTCT7
Correlation	IOTCS1	1.000	0.515	0.584	0.438	0.445	0.443	0.326	0.351	0.396	0.486	0.363	0.361
	IOTCS2	0.515	1.000	0.776	0.641	0.484	0.530	0.596	0.567	0.621	0.560	0.521	0.620
	IOTCS3	0.584	0.776	1.000	0.626	0.619	0.653	0.521	0.534	0.656	0.657	0.590	0.618
	IOTCS4	0.438	0.641	0.626	1.000	0.782	0.673	0.644	0.593	0.555	0.640	0.606	0.596
	IOTCS5	0.445	0.484	0.619	0.782	1.000	0.686	0.638	0.568	0.534	0.680	0.627	0.460
	IOTCT1	0.443	0.530	0.653	0.673	0.686	1.000	0.763	0.762	0.700	0.782	0.737	0.716
	IOTCT2	0.326	0.596	0.521	0.644	0.638	0.763	1.000	0.792	0.705	0.687	0.743	0.675
	IOTCT3	0.351	0.567	0.534	0.593	0.568	0.762	0.792	1.000	0.764	0.710	0.733	0.654
	IOTCT4	0.396	0.621	0.656	0.555	0.534	0.700	0.705	0.764	1.000	0.743	0.711	0.737
	IOTCT5	0.486	0.560	0.657	0.640	0.680	0.782	0.687	0.710	0.743	1.000	0.784	0.744
	IOTCT6	0.363	0.521	0.590	0.606	0.627	0.737	0.743	0.733	0.711	0.784	1.000	0.722
	IOTCT7	0.361	0.620	0.618	0.596	0.460	0.716	0.675	0.654	0.737	0.744	0.722	1.000
Sig. (1-tailed)	IOTCS1		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	IOTCS2	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	IOTCS3	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	IOTCS4	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	IOTCS5	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
	IOTCT1	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
	IOTCT2	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	IOTCT3	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
	IOTCT4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	IOTCT5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
	IOTCT6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	IOTCT7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

a. Determinant = 1.208E-5

In addition, the value of KMO measure for sampling adequacy was 0.905 (>0.5) and Bartlett's test of sphericity was significant (p<0.001) as presented in Table 5.18 below. Thus, it is relevant to state that the factor analysis is appropriate to be conducted for these data.

Table 5.18

The result of KMO and Bartlett's test for Importance of Technical Communication Pedagogical Model construct.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.905
Bartlett's Test of Sphericity	Approx. Chi-Square	1066.308
	df	66
	Sig.	0.000

In the next analysis, based on the Kaiser's (1960) criterion (eigenvalue bigger than 1), all 12 items yielded two factors, which explained 68.754% of the total variance, as presented in Table 5.19. This total value is acceptable as it is higher than 50% cut-off value (Chinna, 2009).

Table 5.19

The result of total variance explained for Importance of Technical Communication Pedagogical Model construct.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.860	65.502	65.502	7.565	63.045	63.045	7.217
2	1.029	8.578	74.081	0.685	5.709	68.754	6.001
3	0.721	6.005	80.086				
4	0.543	4.526	84.612				
5	0.412	3.432	88.043				
6	0.321	2.672	90.715				
7	0.264	2.198	92.913				

8	0.249	2.076	94.989
9	0.195	1.628	96.617
10	0.181	1.510	98.127
11	0.127	1.056	99.182
12	0.098	0.818	100.000

*Extraction Method: Principal Axis Factoring

In addition, the scree plot below (Figure 5.5) indicated that only two-factor solution should be considered as the pronounced inflection point was at factor three.

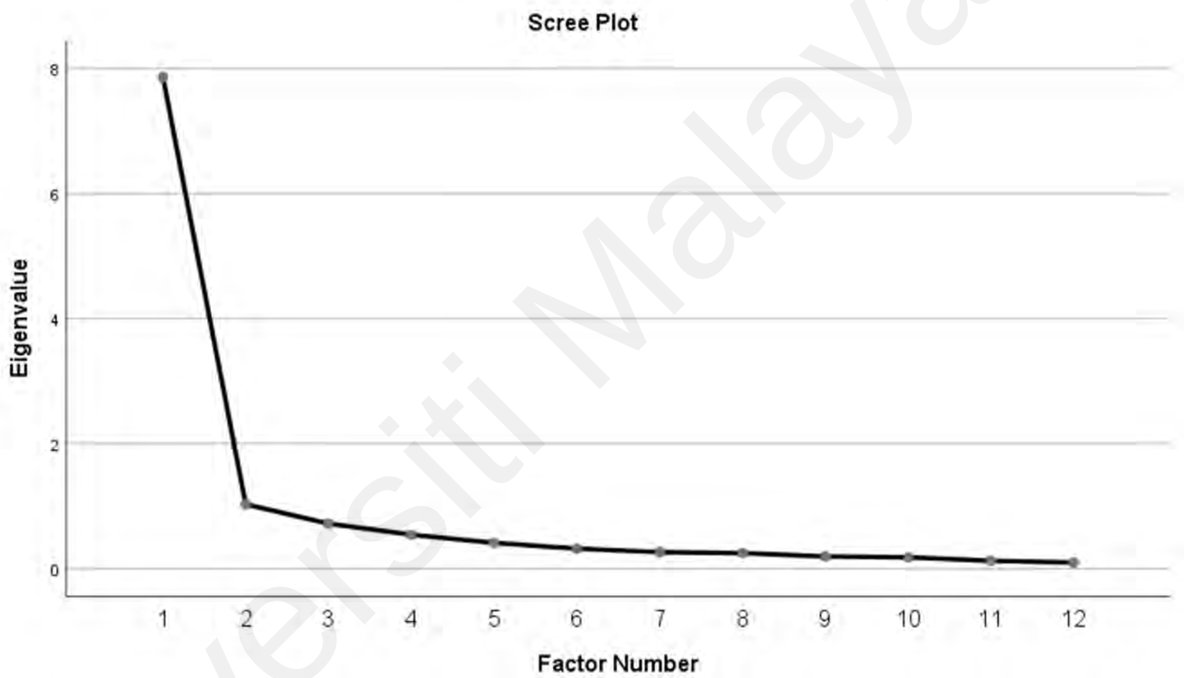


Figure 5.5 Scree plot for Importance of Technical Communication Pedagogical Model construct.

Thus, both results of Kaiser's (1960) criterion (eigenvalue bigger than 1) and scree plot indicated that a two-factor solution was ideal for these data.

In addition, based on the item loadings on each factor, as presented in Table 5.20, two factors were extracted: Teaching Competency (Factor 1) and Learning Environment (Factor 2). The concept behind Teaching Competency and Learning Environment was derived from an extensive review of literature (Chapter 2) on importance of pedagogy. For instance, Watkins and Mortimore (1999) noted that teachers' competency in designing and implementing relevant teaching strategy is vital to ensure students' knowledge development and mastery. In fact, they highlighted how an engaging learning environment should be one of the major focus in teaching and learning design. Similarly, in developing technical communication in Malaysian Vocational Colleges, both teaching competency and learning environment should be the central focus in instructional design and implementation (Lappalainen, 2010; Reaves, 2004).

Table 5.20

Pattern matrix for Perceived Importance of Technical Communication Pedagogical Model construct.

	Factor	
	1	2
IOTCT3	0.948	
IOTCT2	0.936	
IOTCT6	0.892	
IOTCT1	0.797	
IOTCT4	0.735	
IOTCT5	0.722	
IOTCT7	0.705	
IOTCS5	0.431	
IOTCS3		0.939
IOTCS2		0.719
IOTCS1		0.715
IOTCS4		0.454

Based on the above analysis, there were only two factors (Teaching Competency and Learning Environment) identified with 12 items.

Exploratory Factor Analysis for Perceived Importance Of English Language Proficiency Construct.

For items in Perceived Importance of English Language Proficiency construct**,** the EFA with promax rotation was performed. Initially, the results of the correlation matrix indicated that one item (IOELP1) achieved a correlation value below 0.3. Hence, this item was omitted as suggested by Yong and Pearce (2013). After deletion, all items have achieved correlation value between 0.351 to 0.478 between items, indicating acceptable correlation values as presented in Table 5.21 below.

Table 5.21

Correlation matrix for items in for Perceived Importance of English Language Proficiency construct.

		IOELP2	**IOELP3**	**IOELP4**
Correlation	**IOELP2**	1.000	0.351	0.385
	IOELP3	0.351	1.000	0.478
	IOELP4	0.385	0.478	1.000
Sig. (1-tailed)	**IOELP2**		0.000	0.000
	IOELP3	0.000		0.000
	IOELP4	0.000	0.000	

a. Determinant = .630

In addition, the value of KMO measure for sampling adequacy was 0.650 (>0.5) and Bartlett's test of sphericity was significant (p<0.001) as presented in Table 5.22 below. Thus, it is relevant to state that the factor analysis is appropriate to be conducted for these data.

Table 5.22

The result of KMO and Bartlett's test for Perceived Importance of English Language Proficiency construct.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.650
Bartlett's Test of Sphericity	Approx. Chi-Square	44.965
	df	3
	Sig.	0.000

In the next analysis, all three items yielded one factor, which explained 41.389% of the total variance (with eigenvalue bigger than 1), as presented in Table 5.23. This total value is acceptable even though it is slightly lower than 50% cut-off value. Hair et al. (2010) claims that this value is acceptable and not uncommon in social sciences.

Table 5.23

The result of total variance explained for Perceived Importance of English Language Proficiency construct.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.811	60.379	60.379	1.242	41.389	41.389
2	0.670	22.318	82.697			
3	0.519	17.303	100.000			

*Extraction Method: Principal Axis Factoring

In addition, the scree plot below (Figure 5.6) indicated that only one factor solution should be considered as the pronounced inflection point was at factor two.

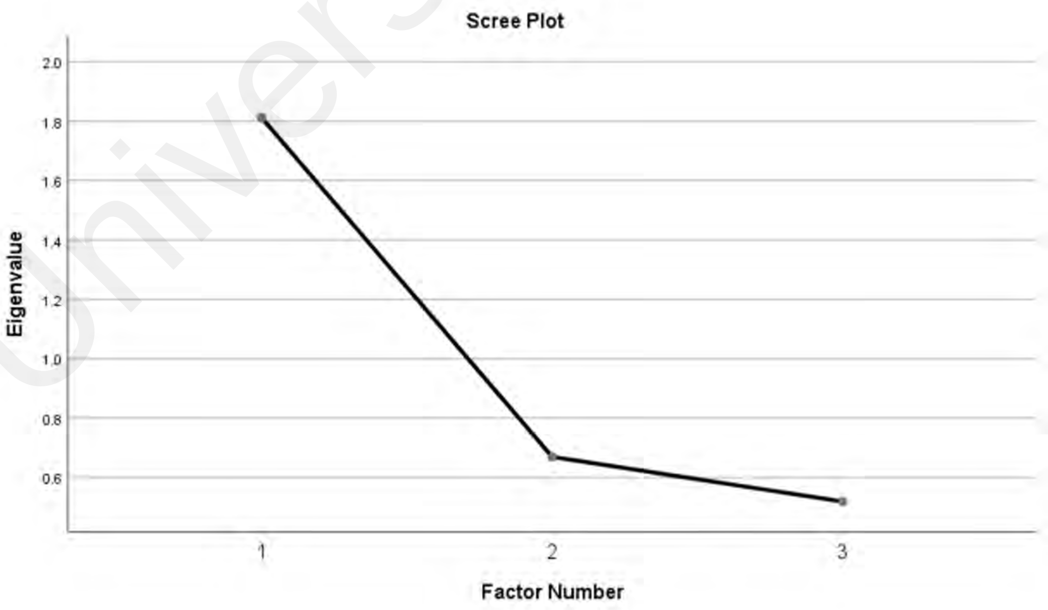


Figure 3.6 Scree plot for Perceived Importance of English Language Proficiency construct.

Thus, both results of Kaiser's (1960) criterion (eigenvalue bigger than 1) and scree plot indicated that a two-factor solution was ideal for these data.

Reliability Analysis.

The Cronbach's alpha reliability test was conducted for all constructs after the EFA. The alpha value for all eight factors was between 0.671 to 0.949. Table 5.24 presents the alpha value for each construct for this study.

Table 5.24
The Cronbach's alpha measure of reliability.

Factor	No. of item	Cronbach's alpha value
F1: Objective	7	0.896
F2: Social Literacy Skills (Content of Learning)	9	0.935
F3: Oral Presentation Skills (Content of Learning)	8	0.874
F4: Method of Delivery	6	0.850
F5: Assessment Method	5	0.830
F6: Learning Environment (Perceived Importance of Technical Communication Pedagogical Model)	8	0.949
F7: Teaching Competency (Perceived Importance of Technical Communication Pedagogical Model)	4	0.856
F8: Perceived Importance of English Language Proficiency	3	0.671

Based on above table, all seven factors (Factor 1 to 7) achieved above than 0.8 alpha value and one factor (Factor 8) achieved slightly lower, with alpha value of 0.671. Hair et al. (2010) state that the minimum acceptable alpha value should be 0.70, but for exploratory study the minimum acceptable alpha value is 0.60. Thus, all eight factors have achieved acceptable alpha value, indicating that these factors have a good internal consistency.

Conclusion

In short, the EFA results have provided clearer dimensions and evidence of validity of the proposed questionnaire. Also, the reliability analysis showed that all constructs have achieved acceptable Cronbach's alpha value, indicating all construct have achieved a good internal consistency. Hence, the final instrument is suitable to be employed for data collection in model development phase.

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CHAPER 6

ANALYSIS AND RESULT OF MODEL DEVELOPMENT

Introduction

In this section, the demographic information of respondents, normality of data analysis and SEM analysis are presented. In this study, survey questionnaire data was analyzed using PLS-SEM. The analysis started with measurement model (outer-model) and was followed by structural model (inner-model) as suggested by Chin (2002).

Demographic Information of Respondents

The demographic information of respondents for this study, according to their zone, gender, age and working experience, is presented in Table 6.1 below.

Table 6.1

Demography of respondents.

General profile	Frequency	Percentage (%)
Zone		
Northern	55	26.8
Central	27	13.2
Southern	45	22
Eastern	43	21
Sabah	18	8.8
Sarawak	17	8.3
Total	**205**	**100**

Gender		
Male	42	20.5
Female	163	79.5
Total	**205**	**100**
Age		
20-29 years old	28	13.7
30-39 years old	59	28.8
40-49 years old	75	36.6
50 years old and above	43	21
Total	**205**	**100**
Working Experience		
Less than 5 years	31	15.1
6-10 years	15	7.3
11-15 years	52	25.4
16-20 years	46	22.4
21-25 years	27	13.2
26-30 years	22	10.7
More than 31 years	12	5.9
Total	**205**	**100**

The overall respondents that have answered the survey questionnaire were 205. From this number, 55 respondents (26.8%) were from Northern zone, 45 respondents (22%) from Southern, 43 respondents (21%) from Eastern, 27 respondents (13.2%) from Central, 18 respondents (8.8%) from Sabah and 17 respondents (8.3%) from Sarawak. Majority of them were female (N=163, 79.5%) and only 42 male respondents

(20.5%). Out of 205 respondents, 75 respondents (36.6%) were around 40 to 49 years old, 59 respondents (28.8%) were around 30 to 39 years old, 43 respondents (21%) were 50 years old and above, and only 28 respondents (13.7%) were around 20 to 29 years old. In addition, out of 205 respondents, 52 respondents (25.4%) have working experience between 11 to 15 years (25.4%), 46 respondents (22.4%) have working experience between 16 to 20 years, 31 respondents (15.1%) have working experience less than five years, 27 respondents (13.2%) have working experience between 21 to 25 years, 22 respondents (10.7%) have working experience between 26 to 30 years, and only 15 respondents (7.3%) have working experience between six to ten years.

Normality of the Data

For this study, the normality and distribution of the data were tested. For normality tests, Kolmogorov-Smirnov and Shapiro Wilk test were used. According to Hussin, Ali and Noor (2014), a data is assumed to be normally distributed if the result of Kolmogorov-Smirnov and Shapiro Wilk test are insignificant (p>0.05).

Table 6.2

The Result of Normality Tests.

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	df	Sig.	Statistic	df	Sig.
Objective	0.125	205	0.000	0.932	205	0.000
Oral Presentation	0.124	205	0.000	0.929	205	0.000
Social Literacy	0.134	205	0.000	0.886	205	0.000
Method	0.122	205	0.000	0.928	205	0.000
Assessment	0.124	205	0.000	0.947	205	0.000
English	0.144	205	0.000	0.916	205	0.000
Learning Environment	0.118	205	0.000	0.910	205	0.000
Teaching Competency	0.188	205	0.000	0.927	205	0.000

Based on the above table (Table 6.2), the results of Kolmogorov-Smirnov and Shapiro Wilk were all significant ($p<0.05$), indicating the data was not normally distributed. In addition, Husin et al. (2014) specified that the Skewness and Kurtosis value must be between -1.96 to +1.96 prove that the data is normally distributed. In this study, the values of Skewness were all above 1.96 value. The Kurtosis value for Objective, Oral Presentation, and Social Literacy were above 1.96, except for Method, Assessment, English Language Proficiency, Learning Environment and Teaching Competency (refer Appendix B). Based on the tests results, the data for this study was likely to be non-normal.

Since the analysis was conducted using SmartPLS, the normality of the data is not an issue. Previously, it has been established that the SmartPLS (PLS-SEM) is the best alternative to CB-SEM in analyzing non-normal data (Garson, 2016; Hair, Hult, Ringle & Sarstedt,2017; Ramayah et al., 2018). The resampling method trough bootstrapping function will allow the calculation of non-normal data possible, especially in significance testing (Garson, 2016).

Initial Measurement model

In the analysis for measurement model, Chin (1998) suggested that the process should start with identifying the indicator reliability, where the outer loading of items should be above 0.70. This is followed by analysis of reliability (Cronbach's Alpha and composite reliability) and validity (convergent and discriminant validity). However, in this study, the proposed measurement model consists lower-order and higher-order construct. According to Hair et al. (2017) there are two approaches to analyze higher-order constructs; a) repeated indicators, and b) two-step approach. Ghozali (2008) explained that in repeated indicators approach, the higher-order construct is measured using similar indicators used in first-order constructs. These indicators are used twice, in the lower-order and again in higher-order construct. On the other hand, in two-stage approach, Henseler, Wilson, Götz and Hautvast (2007) explained that the analysis of first-order construct is conducted first without the higher-order construct in the measurement model. Once completed, in the second stage, the results of first-order construct are used to as indicators for second-order construct analysis. In this study, the repeated indicators approach was selected.

Later, in the analysis for structural model, after the measurement model has achieved its reliability and validity, the estimation of assumed causal and covariance linear relationship (among the independent and dependent variables) was conducted. Chin (2002) suggests that the important criterion for this analysis includes the estimation of determination coefficient (R^2), path coefficient (β), effect size (f^2) and prediction relevance (q^2).

Based on the review of literature and findings of fuzzy delphi, the initial measurement model is presented in Figure 6.1 below. There are four lower-order constructs and two higher-order constructs for this study. Objective construct has seven items (labelled as OBJ1, OBJ2, OBJ3, OBJ4, OBJ5, OBJ6 and OBJ7). Content of Learning construct consists of two constructs; a) Oral Presentation (with item COL1, COL2, COL3, COL4. COL5, COL6, COL7 and COL8) and b) Social Literacy (with item COL9, COL10, COL11, COL12. COL13, COL14, COL15, COL16 and COL17). Method of Delivery construct, named as Method has six items (labelled as MET1, MET2, MET3, MET4, MET5 and MET6). Assessment Method construct, named as Assessment has five items (labelled as ASM1, ASM2, ASM3, ASM4, and ASM5). Lastly, Perceived Importance of Technical Communication Pedagogical Model construct, named as Technical Communication, consists of two constructs: a)

Teaching Competency (with item TC1, TC2, TC3, TC4, TC5, TC6, TC7 and TC8), and b) Learning Environment (with item TC9, TC10, TC11 and TC12.

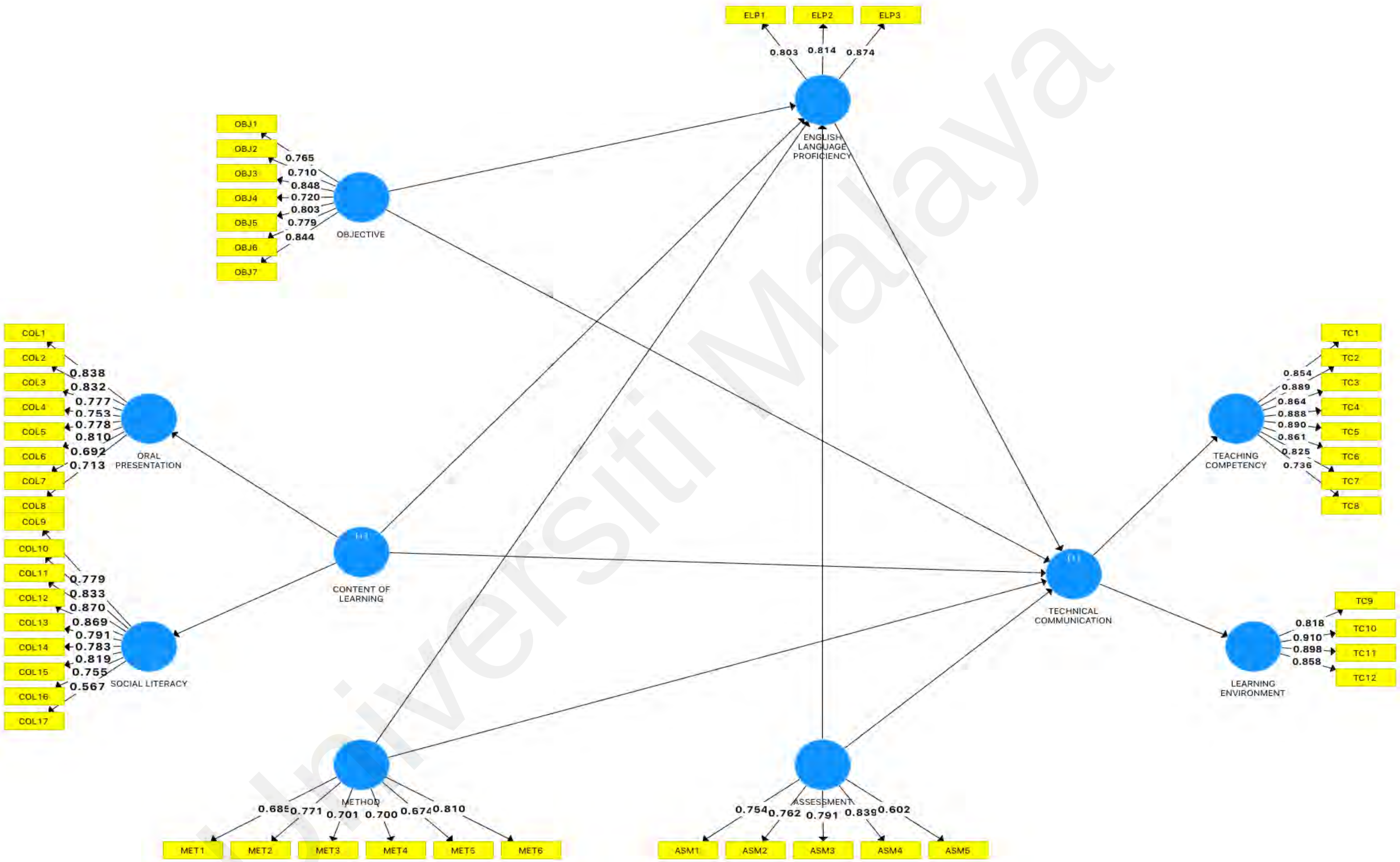

Figure 6.1 The initial measurement model.

In order to assess reliability and validity of initial measurement model above, specifically the outer model, there are a number of criteria that should be fulfilled. For reliability, Hair et al. (2016) suggested to identify composite reliability (CR) and outer loading of each item. The value of 0.60 to 0.70 is acceptable CR value (Chin, 1998), especially for exploratory study (Hult, Ringle & Sarstedt, 2014). However, it is better if the items achieved the CR value 0.70 to 0.90 (Henseler et al., 2009), but not above 0.90 as the items might be redundant (Drolet & Morrison, 2001; Garson, 2016). In addition, the Cronbach's Alpha value should be above 0.60 to 0.90 (Hair et al., 2006; Nunally & Bersein, 1994) to indicate that the items have achieved internal consistency reliability. Also, the outer loading of the items must achieve acceptable value above 0.40 (Hulland, 1999), but it is suggested that the value above 0.70 is preferable (Henseler et al., 2009).

On the other hand, Garson (2016) stated that there are two types of validity tests in PLS-SEM; convergent and discriminant validity. Generally, convergent validity is conducted to ensure that all items in a construct are correlated with each other (Garson, 2016). In measuring this, the outer loading must achieve value above 0.40, but preferably above 0.70 (Henseler et al., 2009; Garson, 2016; Hair et al., 2017). This is because a latent variable should be explained by at least 50% of items' variance. However, a good outer loading value should be above 0.70 (Garson, 2016). In addition, the Average Variance Extracted (AVE) value should be above 0.50 (Chin, 1998). AVE is used to in this analysis as it represents the amount of variance of items to explain each latent variable in a model (Garson, 2016).

Lastly, to assess discriminant validity, Garson (2016) suggested the use of Fornell and Larcker's (1981) criterion, evaluation of cross loadings and Heterotrait-Monotrait Ratio (HTMT). The constructs are considered to achieve discriminant validity when the value of squared AVE is higher than the correlation value with other constructs (Gefen & Straub, 2005). In addition, it is advisable to analyze the cross-loading values. Garson (2016) justified that the loadings of items on its construct must be higher compared to cross loading values with other constructs. Again, Garson (2016) cautioned that the items should achieve loading value above 0.70, in order to ensure discriminant validity of a construct. Finally, the HTMT values should be below 0.85 (Kline, 2011) or 0.90 (Henseler et al., 2015), indicating an acceptable discriminant validity. The value is achieved by dividing the mean of heterotrait correlations with mean of monotrait correlations (Garson, 2016). Once the outer model has achieved aforementioned criterion, the analysis of inner model can be conducted. Table 6.3 is a summary of criteria to assess reliability and validity of outer model.

Table 6.3
Criteria to assess reliability and validity of outer model.

Test	**Threshold value**	**Indicator**	**Reference**
		Reliability	
Composite Reliability (CR)	0.60 to 0.70	acceptable	Chin (1998)
	above 0.70 to 0.80	good	Henseler et al. (2009)
	above 0.80 to 0.90	ideal	Daskalakis and Mantas (2008)
	above 0.95	redundant items	Drolet and Morrison (2001); Hair et al. (2017)
Cronbach's Alpha	above 0.60	acceptable for exploratory study	Garson (2016)
	above 0.70	acceptable	Garson (2016)
	above 0.80 to 0.90	good	Nunally and Bersein (1994)

Outer loading	**above 0.40**	**acceptable**	**Hulland (1999)**
	above 0.70	good	Henseler et al. (2009)
		Convergent Validity	
Outer loading	above 0.40	acceptable	Hulland (1999)
	0.50 to 0.60	acceptable for newly develop instrument	Chin (1998)
	above 0.70	good	Henseler et al. (2009); Garson (2016)
Average Variance Extracted (AVE)	above 0.50	acceptable	Chin (1998)
		Discriminant Validity	
Fornell and Larcker's (1981) criterion	square root of AVE is higher than correlation with other constructs	acceptable	Gefen and Straub (2005)
Cross loadings	loadings of items for its construct must be higher than the value of cross loadings	acceptable	Gefen and Straub (2005); Hair et al. (2014)
HTMT	lower than 0.85	good	Kline (2011)
	lower than 0.90	acceptable	Henseler et al. (2015)

Construct reliability of measurement model. The reliability for all constructs in the initial measurement model (outer model) was assessed by identifying the outer loading, Cronbach's Alpha value and Composite Reliability (CR) value for each latent variable.

Based on the table below (Table 6.4), all items have achieved acceptable outer loading value, between 0.567 to 0.910, indicating acceptable outer loading values. Even though Hulland (1999) stated that the cut-off value above 0.40 is acceptable, these items (item MET1, MET5, ASM5, COL16 and COL7) with loading below than 0.70 should be cautiously treated.

Table 6.4

Outer loading, Cronbach's Alpha and CR value for initial measurement model (first order).

Construct	Indicator	Loading	Cronbach's Alpha	CR
Objective	OBJ1	0.765	0.895	0.917
	OBJ2	0.710		
	OBJ3	0.848		
	OBJ4	0.720		
	OBJ5	0.803		
	OBJ6	0.779		
	OBJ7	0.844		
Content of Learning				
Oral Presentation	COL1	0.838	0.905	0.923
	COL2	0.832		
	COL3	0.777		
	COL4	0.753		
	COL5	0.778		
	COL6	0.810		
	COL7	**0.692**		
	COL8	0.713		
Social Literacy	COL9	0.779	0.922	0.937
	COL10	0.833		
	COL11	0.870		
	COL12	0.869		
	COL13	0.791		
	COL14	0.783		
	COL15	0.819		
	COL16	0.755		
	COL17	**0.567**		
Method	MET1	**0.685**	0.819	0.869
	MET2	0.771		

	MET3	0.701		
	MET4	0.700		
	MET5	**0.674**		
	MET6	0.810		
Assessment	ASM1	0.754	0.806	0.867
	ASM2	0.762		
	ASM3	0.791		
	ASM4	0.839		
	ASM5	**0.602**		
Technical Communication Teaching Competency	TC1	0.854	0.946	**0.955**
	TC2	0.889		
	TC3	0.864		
	TC4	0.888		
	TC5	0.890		
	TC6	0.861		
	TC7	0.825		
	TC8	0.736		
Learning Env.	**TC9**	**0.910**	**0.894**	**0.927**
	TC10	0.898		
	TC11	0.858		
	TC12	0.818		
English Lang. Prof.	ELP1	0.803	0.776	0.870
	ELP2	0.814		
	ELP3	0.874		

In addition, all constructs have achieved acceptable value for Cronbach's Alpha (>0.60) and CR (>0.70). The values of Cronbach's Alpha were between 0.776 to 0.946. On the other hand, the CR values were between 0.867 to 0.955. Based on the above findings, it is relevant to conclude that all latent variables are sufficiently reliable except Teaching Competence construct, as it achieved CR value of 0.955. Hair et al. (2017) cautioned that the CR value above 0.95 as undesirable as the items might be redundant. They suggested that to eliminate semantically identical item to improve CR value. Therefore, item TC1 and TC3 were considered for deletion as they both almost semantically identical.

Validity of measurement model. Two types of validity tests were conducted in this study; a) convergent and b) discriminant validity. Convergent validity was measured by analyzing the outer loadings of indicators in the model and AVE value.

The results in Table 6.5 indicated that the AVE values for all constructs were between 0.568 to 0.760, indicating all construct have achieved acceptable convergent validity.

Table 6.5

Convergent validity for initial measurement model (first order).

Construct	AVE
Objective	0.613
Content of Learning	
Oral Presentation	0.602
Social Literacy	0.624
Method	0.526
Assessment	0.569
Technical Communication	
Teaching Competency	0.726
Learning Environment	0.760
English Language Proficiency	0.690

However, for outer loading of each item in the measurement model (refer Table 5.4, in previous section), there were four items achieved loading value less than 0.70 (item COL7 (0.692), COL17 (0.567), MET1 (0.655), MET5 (0.674) and ASM5 (0.602)). Even though Hair et al. (2014) stated that all items should achieve loading value above 0.70, the value between 0.50 to 0.60 is also acceptable, especially for newly developed instrument (Chin, 1998). However, these items (loading lower than 0.70) should be cautiously treated.

On the other hand, the discriminant validity was measured by Fornell and Larcker's (1981) criterion, analysis of cross loadings and HTMT. The analysis of Fornell and Larcker's (1981) criterion (in Table 6.6) indicated that the correlation values between all constructs were lower compared to every construct squared AVE value, indicating all constructs have achieved discriminant validity.

Table 6.6

The result of Fornell and Larcker's (1981) criterion analysis for initial measurement model (first order).

	Assessment	**English Lang. Proficiency**	**Teaching Competency**	**Method**	**Objective**	**Oral Presentation**	**Social Literacy**	**Learning Environment**
Assessment	**0.754**							
English Language Proficiency	0.482	**0.831**						
Teaching Competency	0.598	0.561	**0.852**					
Method	0.717	0.481	0.623	**0.725**				
Objective	0.348	0.280	0.471	0.441	**0.783**			
Oral Presentation	0.554	0.506	0.610	0.650	0.601	**0.776**		
Social Literacy	0.500	0.476	0.548	0.633	0.563	0.742	**0.790**	
Learning Environment	0.576	0.451	0.748	0.543	0.377	0.506	0.483	**0.872**

*The highlighted values are the squared AVE value.

Next, the HTMT analysis in Table 6.7 indicated that Method to Assessment constructs have achieved the value of 0.871 (stringent cut-off value is 0.85 as proposed by Kline (2001)). Even though this value is acceptable, as it is still lower than 0.90 cut-off value (Henseler et al., 2015), it is worth to further analyze the items that might be problematic. Hence, the analysis of cross loadings was conducted.

Table 6.7

The result of HTMT analysis for initial measurement model (first order).

	Assessment	**English Language Proficiency**	**Teaching Competency**	**Method**	**Objective**	**Oral Presentation**	**Social Literacy**	**Learning Environment**
Assessment								
English Language Proficiency	0.611							
Teaching Competency	0.679	0.651						
Method	**0.871**	0.59	0.7					
Objective	0.394	0.326	0.503	0.507				
Oral Presentation	0.645	0.598	0.66	0.757	0.659			
Social Literacy	0.581	0.558	0.588	0.726	0.619	0.812		
Learning Environment	0.675	0.54	0.811	0.622	0.412	0.561	0.53	

The cross-loading values for all items in the initial measurement model were further analyzed. Garson (2016) mentioned that the loading value for items in its construct should be higher than its cross-loading values. In Table 6.8, it was found that all items loaded higher in its own construct than its cross-loading values, except for item MET6. This item loaded higher than one item in Assessment construct (item ASM5). Hence, item ASM5 and MET6 were considered for deletion from the initial measurement model and the measurement model was re-specified.

Table 6.8

Cross loading values for initial measurement model (first order).

Item	**Assessment**	**Oral Presentation**	**Social Literacy**	**English Language Proficiency**	**Method**	**Objective**	**Teaching Competency**	**Learning Environment**
ASM1	**0.754**	0.448	0.474	0.405	0.632	0.359	0.395	0.351
ASM2	**0.762**	0.426	0.343	0.341	0.479	0.213	0.492	0.414
ASM3	**0.791**	0.446	0.385	0.316	0.602	0.329	0.494	0.495
ASM4	**0.839**	0.465	0.389	0.406	0.625	0.311	0.514	0.515
ASM5	**0.602**	0.286	0.290	0.355	0.338	0.073	0.331	0.378
COL1	0.516	**0.838**	0.623	0.434	0.590	0.470	0.524	0.465
COL2	0.455	**0.832**	0.608	0.397	0.519	0.440	0.451	0.387
COL3	0.502	**0.777**	0.572	0.411	0.528	0.436	0.509	0.401
COL4	0.449	**0.753**	0.497	0.387	0.527	0.370	0.444	0.374
COL5	0.427	**0.778**	0.553	0.376	0.506	0.420	0.476	0.407
COL6	0.410	**0.810**	0.641	0.437	0.511	0.576	0.494	0.397
COL7	0.334	**0.692**	0.506	0.360	0.387	0.489	0.477	0.386

COL8	0.333	**0.713**	0.590	0.329	0.450	0.525	0.411	0.319
COL9	0.393	0.468	**0.779**	0.321	0.462	0.459	0.357	0.357
COL10	0.324	0.575	**0.833**	0.401	0.492	0.476	0.446	0.307
COL11	0.434	0.629	**0.870**	0.444	0.533	0.484	0.496	0.442
COL12	0.433	0.631	**0.869**	0.428	0.577	0.477	0.514	0.419
COL13	0.376	0.570	**0.791**	0.412	0.501	0.407	0.432	0.434
COL14	0.361	0.565	**0.783**	0.301	0.494	0.305	0.366	0.347
COL15	0.471	0.644	**0.819**	0.413	0.577	0.429	0.427	0.417
COL16	0.442	0.669	**0.755**	0.390	0.500	0.483	0.457	0.391
COL17	0.297	0.499	**0.567**	0.232	0.325	0.499	0.382	0.304
ELP1	0.373	0.365	0.374	**0.803**	0.326	0.177	0.410	0.346
ELP2	0.357	0.387	0.388	**0.814**	0.403	0.220	0.462	0.387
ELP3	0.466	0.497	0.422	**0.874**	0.461	0.290	0.519	0.389
MET1	0.492	0.514	0.454	0.324	**0.685**	0.443	0.427	0.350
MET2	0.519	0.497	0.525	0.416	**0.771**	0.312	0.436	0.376
MET3	0.452	0.509	0.500	0.257	**0.701**	0.318	0.403	0.360
MET4	0.505	0.435	0.461	0.380	**0.700**	0.338	0.421	0.388
MET5	0.489	0.398	0.334	0.283	**0.674**	0.227	0.403	0.331
MET6	**0.637**	0.486	0.479	0.405	**0.810**	0.296	0.589	0.522
OBJ1	0.234	0.400	0.457	0.187	0.358	**0.765**	0.342	0.256

OBJ2	0.170	0.326	0.336	0.158	0.184	**0.710**	0.232	0.224
OBJ3	0.322	0.486	0.503	0.250	0.414	**0.848**	0.396	0.312
OBJ4	0.217	0.460	0.310	0.197	0.269	**0.720**	0.349	0.249
OBJ5	0.283	0.549	0.532	0.241	0.389	**0.803**	0.366	0.283
OBJ6	0.310	0.508	0.429	0.232	0.363	**0.779**	0.419	0.352
OBJ7	0.323	0.516	0.483	0.246	0.386	**0.844**	0.429	0.353
TC1	0.558	0.553	0.507	0.488	0.553	0.399	**0.854**	0.644
TC2	0.530	0.531	0.494	0.494	0.534	0.406	**0.889**	0.641
TC3	0.561	0.505	0.463	0.519	0.543	0.413	**0.864**	0.630
TC4	0.513	0.558	0.445	0.522	0.565	0.416	**0.888**	0.631
TC5	0.486	0.543	0.452	0.459	0.526	0.432	**0.890**	0.618
TC6	0.455	0.479	0.421	0.467	0.513	0.366	**0.861**	0.583
TC7	0.423	0.465	0.469	0.456	0.460	0.390	**0.825**	0.541
TC8	0.527	0.517	0.485	0.414	0.545	0.387	**0.736**	0.804
TC9	0.459	0.383	0.345	0.354	0.391	0.288	0.566	**0.818**
TC10	0.523	0.456	0.422	0.453	0.497	0.276	0.660	**0.910**
TC11	0.509	0.432	0.430	0.396	0.447	0.321	0.651	**0.898**
TC12	0.512	0.486	0.478	0.367	0.545	0.422	0.719	**0.858**

Based on the findings of the initial measurement model analysis, there were a number of items considered for deletion: a) items with factor loading lower than 0.70 (item COL7, COL17, MET1, MET4, MET5 and ASM5), b) items that are almost semantically identical (item TC1 and TC3), and c) item with higher value of cross loading as suggested by HTMT and cross-loading analysis (item MET6). However, the deletion of items was done gradually. As suggested by Hair et al. (2017), deletion of items should be done only if it helped to improve reliability and validity of constructs.

Modified Measurement Model

After modification, the measurement model is illustrated in Figure 6.2 below. Item COL17, COL7, MET4, MET5, MET6, TC1 and TC3 were deleted gradually.

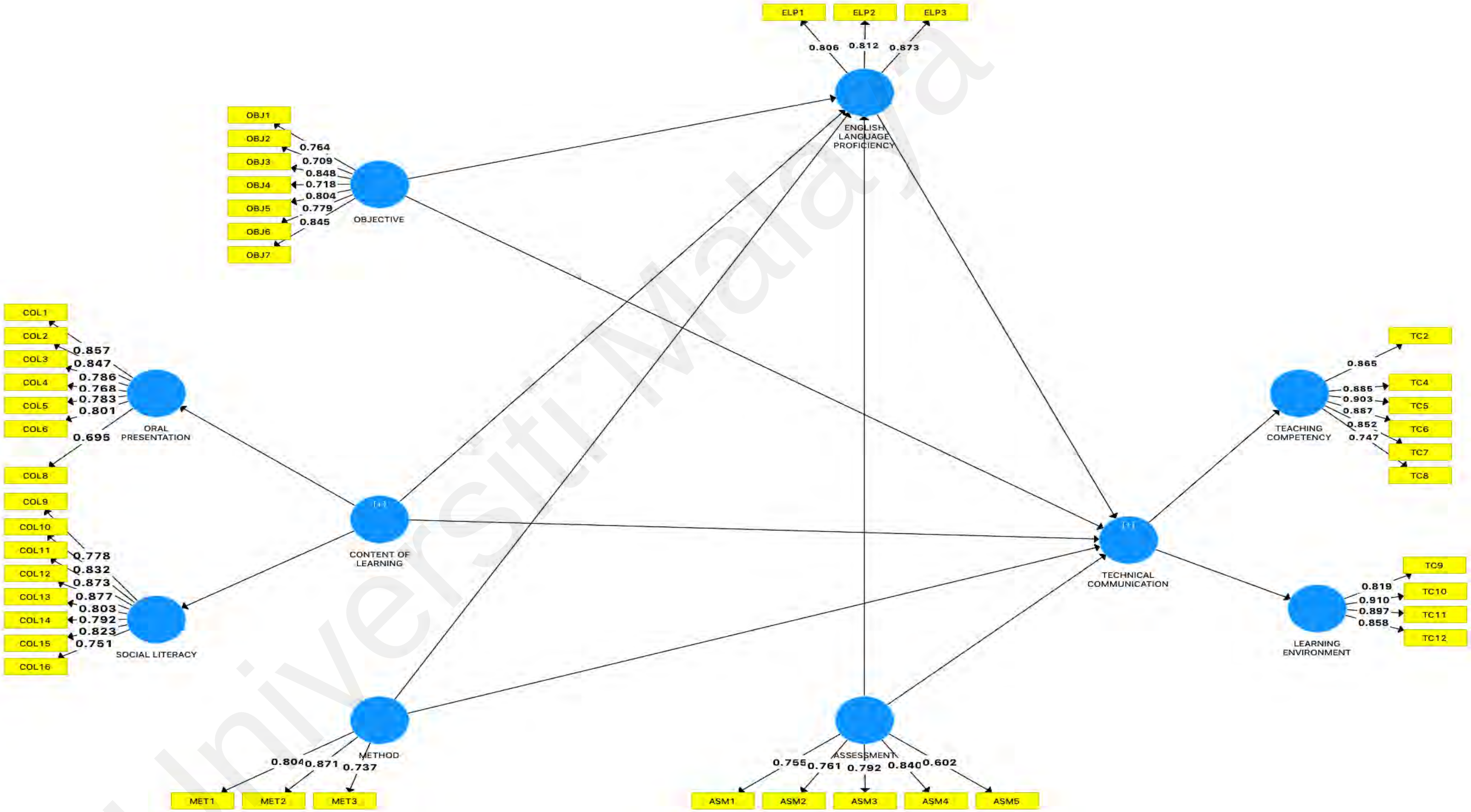

Figure 6.2 The measurement model after modification.

Construct reliability of measurement model (after modification). The reliability for all constructs in the modified measurement model (outer model) was assessed by identifying the outer loading, Cronbach's Alpha value and Composite Reliability (CR) value for each latent variable.

Based on the table below (Table 6.9), all items have achieved acceptable outer loading value, between 0.602 to 0.910, indicating acceptable outer loading values (Hulland,1999; Henseler et al., 2009).

Table 6.9

Outer loading, Cronbach's Alpha and CR value for modified measurement model (first order).

Construct	**Indicator**	**Loading**	**Cronbach's Alpha**	**CR**
Objective	OBJ1	0.764	0.895	0.917
	OBJ2	0.709		
	OBJ3	0.848		
	OBJ4	0.718		
	OBJ5	0.804		
	OBJ6	0.779		
	OBJ7	0.845		
Content of Learning				
Oral Presentation	COL1	0.857	0.900	0.922
	COL2	0.847		
	COL3	0.786		
	COL4	0.768		
	COL5	0.783		
	COL6	0.801		
	COL7	**deleted**		
	COL8	0.695		

Social Literacy	COL9	0.778	0.928	0.941
	COL10	0.832		
	COL11	0.873		
	COL12	0.877		
	COL13	0.803		
	COL14	0.792		
	COL15	0.823		
	COL16	0.751		
	COL17	**deleted**		
Method	MET1	0.804	0.727	0.847
	MET2	0.871		
	MET3	0.737		
	MET4	**deleted**		
	MET5	**deleted**		
	MET6	**deleted**		
Assessment	ASM1	0.755	0.806	0.867
	ASM2	0.761		
	ASM3	0.792		
	ASM4	0.840		
	ASM5	0.602		
Technical Communication				
Teaching Competency	TC1	**deleted**	0.927	0.943
	TC2	0.865		
	TC3	**deleted**		
	TC4	0.885		
	TC5	0.903		
	TC6	0.887		
	TC7	0.852		
	TC8	0.747		

Learning Environment	TC9	0.819	0.894	0.927
	TC10	0.910		
	TC11	0.897		
	TC12	0.858		
English Language Proficiency	ELP1	0.806	0.776	0.870
	ELP2	0.812		
	ELP3	0.873		

In addition, all constructs have achieved acceptable value for Cronbach's Alpha (>0.60) and CR (>0.70). The values of Cronbach's Alpha were between 0.727 to 0.928. On the other hand, the CR values have improved compared to values in initial measurement model. All constructs have achieved CR value between 0.847 to 0.941 (<0.95 cut-off value as suggested by Hair et al. (2017)). Based on the above findings, it is relevant to conclude that all latent variables are sufficiently reliable.

Validity of measurement model. Two types of validity tests were conducted in this study for the modified measurement model; a) convergent and b) discriminant validity. Convergent validity was measured by analyzing the outer loadings of indicators in the model and AVE value.

The results in Table 6.10 indicated that the AVE values for all constructs were between 0.569 to 0.760, indicating all construct have achieved acceptable convergent validity.

Table 6.10

Convergent validity for initial measurement model (first order).

Construct	AVE
Objective	0.613
Content of Learning	
Oral Presentation	0.628
Social Literacy	0.668
Method	0.649
Assessment	0.569
Technical Communication	
Teaching Competency	0.736
Learning Environment	0.760
English Language Proficiency	0.690

In addition, the outer loading value of each item in the modified measurement model (refer Table 6.9, in previous section), were between 0.602 to 0.910, indicating acceptable outer loading values (Hulland,1999; Henseler et al. (2009).

On the other hand, the discriminant validity was measured by Fornell and Larcker's (1981) criterion, analysis of cross loadings and HTMT. The analysis of Fornell and Larcker's (1981) criterion (in Table 6.11) indicated that the correlation values between all constructs were lower compared to every construct squared AVE value, indicating all constructs have achieved discriminant validity.

Table 6.11

The result of Fornell and Larcker's (1981) criterion analysis for modified measurement model (first order).

	Assessment	English Language Proficiency	Learning Environment	Method	Objective	Oral Presentation	Social Literacy	Teaching Competency
Assessment	**0.754**							
English Language Proficiency	0.483	**0.831**						
Learning Environment	0.576	0.451	**0.872**					
Method	0.681	0.455	0.523	**0.782**				
Objective	0.348	0.280	0.377	0.431	**0.783**			
Oral Presentation	0.559	0.501	0.497	0.641	0.585	**0.793**		
Social Literacy	0.496	0.478	0.477	0.625	0.540	0.726	**0.817**	
Teaching Competency	0.572	0.547	0.744	0.593	0.467	0.590	0.529	**0.858**

*The highlighted values are the squared AVE value.

Next, the HTMT analysis in Table 6.12 indicated that all constructs have achieved HTMT value between 0.326 to 0.813 (stringent cut-off value is 0.85 as proposed by Kline (2001)). This result indicated that all constructs have established discriminant validity.

Table 6.12

The result of HTMT analysis for modified measurement model (first order).

	Assessment	**English Language Proficiency**	**Learning Environment**	**Method**	**Objective**	**Oral Presentation**	**Social Literacy**	**Teaching Competency**
Assessment								
English Language Proficiency	0.611							
Learning Environment	0.675	0.540						
Method	0.786	0.546	0.554					
Objective	0.394	0.326	0.412	0.539				
Oral Presentation	0.652	0.594	0.552	0.789	0.641			
Social Literacy	0.574	0.560	0.521	0.746	0.584	0.791		
Teaching Competency	0.657	0.642	0.813	0.633	0.501	0.644	0.569	

Next, the cross-loading values for all items in the modified measurement model were further analyzed. Garson (2016) mentioned that the loading value for items in its construct should be higher than its cross-loading values. In Table 6.13, it was found that all items loaded higher in its own construct than its cross-loading values.

Table 6.13

Cross loading values for modified measurement model (first order).

	Assessment	Oral Presentation	Social Literacy	English Language Proficiency	Method	Objective	Teaching Competency	Learning Environment
ASM1	**0.755**	0.458	0.468	0.405	0.613	0.359	0.383	0.351
ASM2	**0.761**	0.427	0.340	0.341	0.394	0.213	0.467	0.414
ASM3	**0.792**	0.451	0.384	0.316	0.496	0.330	0.486	0.495
ASM4	**0.840**	0.472	0.383	0.406	0.525	0.311	0.489	0.515
ASM5	**0.602**	0.279	0.291	0.355	0.230	0.073	0.312	0.378
COL1	0.516	**0.857**	0.610	0.434	0.555	0.470	0.518	0.464
COL2	0.455	**0.847**	0.596	0.398	0.519	0.440	0.441	0.387
COL3	0.502	**0.786**	0.574	0.410	0.514	0.436	0.520	0.401
COL4	0.449	**0.768**	0.486	0.387	0.523	0.370	0.433	0.374
COL5	0.427	**0.783**	0.547	0.375	0.504	0.420	0.459	0.407
COL6	0.410	**0.801**	0.620	0.437	0.473	0.576	0.487	0.397
COL8	0.333	**0.695**	0.584	0.329	0.426	0.526	0.406	0.319
COL9	0.393	0.469	**0.778**	0.321	0.481	0.460	0.344	0.357
COL10	0.324	0.567	**0.832**	0.402	0.505	0.476	0.447	0.307
COL11	0.434	0.627	**0.873**	0.444	0.491	0.485	0.488	0.442
COL12	0.433	0.617	**0.877**	0.427	0.557	0.478	0.502	0.419
COL13	0.376	0.558	**0.803**	0.411	0.499	0.408	0.425	0.434
COL14	0.362	0.574	**0.792**	0.301	0.450	0.305	0.369	0.347
COL15	0.471	0.645	**0.823**	0.413	0.508	0.430	0.420	0.417
COL16	0.442	0.670	**0.751**	0.389	0.503	0.484	0.450	0.391

ELP1	**0.373**	**0.372**	**0.374**	0.806	**0.300**	**0.177**	**0.405**	**0.346**
ELP2	0.357	0.376	0.391	**0.812**	0.345	0.220	0.448	0.387
ELP3	0.466	0.490	0.423	**0.873**	0.390	0.291	0.503	0.389
MET1	0.492	0.510	0.448	0.323	**0.804**	0.444	0.417	0.350
MET2	0.519	0.505	0.527	0.416	**0.871**	0.312	0.421	0.375
MET3	0.452	0.524	0.505	0.257	**0.737**	0.318	0.418	0.360
OBJ1	0.234	0.384	0.429	0.186	0.371	**0.764**	0.339	0.256
OBJ2	0.170	0.315	0.314	0.158	0.185	**0.709**	0.216	0.224
OBJ3	0.323	0.478	0.486	0.250	0.416	**0.848**	0.396	0.312
OBJ4	0.217	0.444	0.289	0.197	0.256	**0.718**	0.336	0.249
OBJ5	0.283	0.536	0.509	0.241	0.407	**0.804**	0.366	0.283
OBJ6	0.310	0.491	0.421	0.232	0.348	**0.779**	0.415	0.352
OBJ7	0.323	0.505	0.467	0.246	0.381	**0.845**	0.432	0.353
TC2	0.530	0.518	0.487	0.493	0.445	0.406	**0.865**	0.641
TC4	0.513	0.555	0.435	0.522	0.479	0.416	**0.885**	0.631
TC5	0.486	0.529	0.440	0.459	0.445	0.433	**0.903**	0.618
TC6	0.455	0.470	0.418	0.466	0.435	0.367	**0.887**	0.583
TC7	0.423	0.445	0.463	0.456	0.403	0.390	**0.852**	0.541
TC8	0.527	0.510	0.478	0.413	0.455	0.387	**0.747**	0.805
TC9	0.459	0.377	0.334	0.354	0.305	0.288	0.566	**0.819**
TC10	0.523	0.450	0.419	0.453	0.417	0.276	0.648	**0.910**
TC11	0.509	0.420	0.430	0.396	0.374	0.321	0.641	**0.897**
TC12	0.512	0.478	0.472	0.367	0.456	0.423	0.728	**0.858**

In short, after gradual deletion of seven items (COL17, COL7, MET4, MET5, MET6, TC1 and TC3), the modified model has established both reliability and validity. In the next stage, the analysis of the hierarchical construct (Higher-Order Construct, HOC) was conducted.

Higher Order Construct

Construct reliability of measurement model (HOC). The reliability for all items in HOC was assessed by identifying the outer loading, Cronbach's Alpha value and Composite Reliability (CR) value for each latent variable.

Based on the table below (Table 6.14), all items have achieved acceptable outer loading value, between 0.662 to 0.841, indicating acceptable outer loading values (Hulland,1999; Henseler et al. (2009).

Table 6.14

Outer loading, Cronbach's Alpha and CR value for initial measurement model (HOC).

Construct	Indicator	Loading	Cronbach's Alpha	CR
Content of Learning	COL1	0.777	0.944	0.950
	COL2	0.764		
	COL3	0.722		
	COL4	0.662		
	COL5	0.705		
	COL6	0.756		
	COL8	0.681		
	COL9	0.685		
	COL10	0.765		
	COL11	0.819		
	COL12	0.817		
	COL13	0.744		
	COL14	0.744		
	COL15	0.798		
	COL16	0.768		

Technical Communication	TC2	0.828	0.940	0.949
	TC4	0.836		
	TC5	0.841		
	TC6	0.816		
	TC7	0.776		
	TC8	0.823		
	TC9	0.713		
	TC10	0.805		
	TC11	0.795		
	TC12	0.833		

In addition, all constructs have achieved acceptable value for Cronbach's Alpha (>0.60) and CR (>0.70). The values of Cronbach's Alpha were 0.940 (Technical Communication) and 0.944 (Content of Learning). On the other hand, both constructs have achieved CR value of 0.949 (Technical Communication) and 0.950(Content of Learning), indicating these two constructs were reliable (Hair et al., 2017). Based on the above findings, it is relevant to conclude that all HOCs are sufficiently reliable.

Validity of measurement model (HOC). Two types of validity tests were conducted in this study for the HOCs; a) convergent and b) discriminant validity. Convergent validity was measured by analyzing the outer loadings of indicators in the model and AVE value.

The results in Table 6.15 indicated that the AVE values for both constructs were 0.560 (Content of Learning) and 0.652 (Technical Communication), indicating all construct have achieved acceptable convergent validity.

Table 6.15

Convergent validity for measurement model (HOC).

Construct	AVE
Content of Learning	0.560
Technical Communication	0.652

In addition, the outer loading value of each item in the HOCs (refer Table 5.14, in previous section), were between 0.662 to 0.841, indicating acceptable outer loading values (Hulland,1999; Henseler et al. (2009).

On the other hand, the discriminant validity was measured by Fornell and Larcker's (1981) criterion, analysis of cross loadings and HTMT. The analysis of Fornell and Larcker's (1981) criterion (in Table 6.16) indicated that the correlation values between all constructs were lower compared to every construct squared AVE value, indicating all constructs have achieved discriminant validity.

Table 6.16

The result of Fornell and Larcker's (1981) criterion analysis for measurement model (HOC).

	Assessment	**Content of Learning**	**English Language Proficiency**	**Method**	**Objective**	**Technical Communication**
Assessment	**0.754**					
Content of Learning	0.565	**0.749**				
English Language Proficiency	0.483	0.526	**0.831**			
Method	0.606	0.669	0.418	**0.806**		
Objective	0.348	0.603	0.280	0.442	**0.783**	
Technical Communication	0.613	0.608	0.543	0.524	0.460	**0.807**

*The highlighted values are the squared AVE value.

Next, the HTMT analysis in Table 6.17 indicated that all constructs have achieved HTMT value between 0.394 to 0.812 (stringent cut-off value is 0.85 as proposed by Kline (2001)). This result indicated that all constructs have established discriminant validity.

Table 6.17

The result of HTMT analysis for measurement model (HOC).

	Assessment	Content of Learning	English Language Proficiency	Method	Objective	Technical Communication
Assessment						
Content of Learning	0.647					
English Language Proficiency	0.611	0.610				
Method	0.786	0.812	0.546			
Objective	0.394	0.647	0.326	0.539		
Technical Communication	0.700	0.643	0.633	0.634	0.491	

Next, the cross-loading values for all items in the modified measurement model were further analyzed. Garson (2016) mentioned that the loading value for items in its construct should be higher than its cross-loading values. In Table 6.18, it was found that all items loaded higher in its own construct than its cross-loading values.

Table 6.18

Cross loading values for modified measurement model (HOC).

	Assessment	**Content of Learning**	**English Language Proficiency**	**Method**	**Objective**	**Technical Communication**
ASM1	**0.755**	0.499	0.405	0.613	0.359	0.395
ASM2	**0.761**	0.409	0.341	0.394	0.213	0.476
ASM3	**0.792**	0.447	0.316	0.496	0.330	0.523
ASM4	**0.840**	0.456	0.406	0.525	0.311	0.533
ASM5	**0.602**	0.308	0.355	0.230	0.073	0.362
COL1	0.516	**0.777**	0.434	0.555	0.470	0.530
COL2	0.455	**0.764**	0.398	0.519	0.440	0.448
COL3	0.502	**0.722**	0.410	0.514	0.436	0.505
COL4	0.449	**0.662**	0.387	0.523	0.370	0.438
COL5	0.427	**0.705**	0.375	0.504	0.420	0.468
COL6	0.410	**0.756**	0.437	0.473	0.576	0.481
COL8	0.333	**0.681**	0.329	0.426	0.526	0.396
COL9	0.393	**0.685**	0.321	0.481	0.460	0.373
COL10	0.324	**0.765**	0.402	0.505	0.476	0.417
COL11	0.434	**0.819**	0.444	0.491	0.485	0.501
COL12	0.433	**0.817**	0.427	0.557	0.478	0.500
COL13	0.376	**0.744**	0.411	0.499	0.408	0.458
COL14	0.362	**0.744**	0.301	0.450	0.305	0.384
COL15	0.471	**0.798**	0.413	0.508	0.430	0.447
COL16	0.442	**0.768**	0.389	0.503	0.484	0.455
ELP1	0.373	0.402	**0.806**	0.300	0.177	0.407
ELP2	0.357	0.414	**0.812**	0.345	0.220	0.453

ELP3	0.466	0.488	**0.873**	0.390	0.291	0.489
MET1	0.492	0.512	0.323	**0.804**	0.444	0.417
MET2	0.519	0.556	0.416	**0.871**	0.312	0.430
MET3	0.452	0.553	0.257	**0.737**	0.318	0.421
OBJ1	0.234	0.440	0.186	0.371	**0.764**	0.327
OBJ2	0.170	0.338	0.158	0.185	**0.709**	0.234
OBJ3	0.323	0.519	0.250	0.416	**0.848**	0.387
OBJ4	0.217	0.387	0.197	0.256	**0.718**	0.322
OBJ5	0.283	0.561	0.241	0.407	**0.804**	0.355
OBJ6	0.310	0.488	0.232	0.348	**0.779**	0.416
OBJ7	0.323	0.521	0.246	0.381	**0.845**	0.428
TC2	0.530	0.540	0.493	0.445	0.406	**0.828**
TC4	0.513	0.527	0.522	0.479	0.416	**0.836**
TC5	0.486	0.518	0.459	0.445	0.433	**0.841**
TC6	0.455	0.475	0.466	0.435	0.367	**0.816**
TC7	0.423	0.490	0.456	0.403	0.390	**0.776**
TC8	0.527	0.530	0.413	0.455	0.387	**0.823**
TC9	0.459	0.381	0.354	0.305	0.288	**0.713**
TC10	0.523	0.466	0.453	0.417	0.276	**0.805**
TC11	0.509	0.458	0.396	0.374	0.321	**0.795**
TC12	0.512	0.511	0.367	0.456	0.423	**0.833**

Prior to evaluating the path model, the significance levels of LOCs and HOCs were analyzed using Bootstrapping function with 5000 subsamples, as suggested by Garson (2016). Ghozali (2008) suggested for HOC, the path coefficient, t-value, p-value and R^2 value should be reported in order to confirm the relationship with LOC.

Table 6.19

Relationship testing for HOC.

	β	**Std. Error**	**T-value**	**P-value**	**Remark**	**R^2**
Content of Learning -> Oral Presentation	0.915	0.019	49.145	0.000*	Sig.	0.838
Content of Learning -> Social Literacy	0.941	0.011	85.478	0.000*	Sig.	0.886
Technical Communication -> Learning Environment	0.905	0.014	64.075	0.000*	Sig.	0.819
Technical Communication -> Teaching Competency	0.958	0.007	131.665	0.000*	Sig.	0.526

*p<0.01

Based on the results in Table 6.19, all four LOCs have significant relationship with respective HOCs. All constructs have achieved t-value above 1.96 (Hair et al., 2017), and significant at 0.001 value (Hair et al., 2017). For instance, Content of Learning has a significant relationship with both Oral Presentation (β=0.915, $p<0.001$) and Social Literacy (β=0.941, $p<0.001$). Similarly, Technical Communication has a significant relationship with both Learning Environment (β=0.905, $p<0.001$) and Teaching Competency (β=0.958, $p<0.001$). On the other hand, the R^2 value for all constructs were moderate (above 0.50) and substantial (above 0.75) (Hair et al., 2017). For Teaching Competence, the R^2 value was 0.526, explaining 52.60% of the variance of Technical Communication. On the other hand, the value of R^2 was 0.838for Oral Presentation (explaining 83.80% of the variance of Content of Learning), 0.886 for

Social Literacy Presentation (explaining 88.60% of the variance of Content of Learning), and 0.819 for Learning Environment (explaining 81.90% of the variance of Technical Communication). Based on these results, it can be concluded that the HOCs have a significant relationship with its respective LOCs.

Analysis of Structural Model.

In assessing structural model there are five assessments that should be conducted: a) collinearity, b) significance and relevance of proposed relationships, c) R^2 level, d) effect size (f^2), and e) predictive relevance (Q^2) (Hair at al., 2017; Ramayah, et al., 2018). Assessment of collinearity is conducted to ensure not more than one variable measure a similar construct (Ramayah et al., 2018). Garson (2016) supported that multicollinearity potentially exists in both reflective and formative model at the structural level. Therefore, it is important to run Variance Inflation Factor (VIF) assessment by analyzing the "Inner VIF values" for reflective model (Garson, 2016). The value should be between 0.20 to 0.5 (Garson, 2016; Hair, Ringle & Sarstedt, 2011). Secondly, in assessing significance and relevance of relationships in structural model, bootstrapping with 5000 subsamples is suggested by Garson (2016). Since PLS-SEM is a non-parametric analysis, the t-value and p-value are generated through this option. Wong (2013) justified that through bootstrapping, the t-value and p-value can be achieved in order to test significance of the structural model. For this assessment, the t-value should be above 1.96 and p-value should be below 0.05 (Garson, 2016; Ramayah et al., 2018). However, Hair et al. (2017) mentioned that the cut-off values of $p<0.10$ and $t>1.96$ are acceptable. Garson (2016) supported that the value of 0.10 for p-value is acceptable for exploratory research.

Next, R^2 level is an assessment to measure predictive accuracy of the model (Garson, 2016; Ramayah et al., 2018). Ramayah et al. (2018) explained that R^2 value indicates the amount variance in the endogenous variable explained by the model. Hair et al. (2017) suggested the categorization of the R^2 levels into three: a) 0.25 as weak, b) 0.50 as moderate, and c) 0.75 as substantial level of predictive accuracy. On the other hand, the effect size (f^2) is an assessment of effect size with change in R^2. As mentioned by Ramayah et al. (2018), effect size (f^2) is calculated by dividing the value of R^2 included - R^2 excluded, with the value of 1 - R^2 included (R^2 included - R^2 excluded / 1 - R^2 included). Both Garson (2016) and Ramayah et al. (2018) referred to Cohen's (1988) interpretation of f^2 value, where 0.02 is considered small effect, 0.15 is considered medium effect, and 0.35 is considered high effect. Next, the assessment of Q^2 (predictive relevance) is a measure to assess the predictive relevance of the path modelling the study. Ramayah et al. (2018) mentioned that this procedure is conducted using blindfolding option, where the sample is being re-used (resampling)with systematic deletion and prediction of endogenous construct. Hence, the Q^2 value should be above 0 in order to conclude that the construct has predictive relevance (Fornell & Cha, 1994; Garson, 2016).

Multicollinearity assessment through identification of VIF values. The result of multicollinearity assessment indicated that all inner VIF values for exogenous variables were less than 5.0 (refer table 6.20), indicating that multicollinearity was not an issue in this structural model (Hair et al., 2017).

Table 6.20

Inner VIF for structural model.

	Assessment	**Content of Learning**	**English Language Proficiency**	**Learning Environ.**	**Method**	**Objective**	**Oral Present.**	**Social Literacy**	**Teaching Comp.**	**Technical Comm.**
Assessment			1.705							1.814
Content of Learning			2.448				1.000	1.000		2.690
English Language Proficiency										1.492
Learning Environ.										
Method			2.111							2.112
Objective			1.578							1.584
Oral Present.										
Social Literacy										
Teaching Comp.										
Technical Comm.				1.000					1.000	

Significance of relationships assessment for structural model. In determining the t-value, significance value (p-value) and path coefficient of all paths in the proposed model, bootstrapping function was used. Based on the results of significance of relationships assessment (Table 6.21), all exogenous constructs have a significant relationship in predicting the endogenous construct (Technical Communication), except for Method construct ($p>0.005$, $t<1.645$).

The analysis of relative importance of exogenous constructs to predict Technical Communication showed that Assessment was the most important predictor (0.316), and was followed by English Language Proficiency (0.231), Content of Learning (0.186) and Objective (0.154).

Table 6.21

Significance of relationships for structural model.

	β	**Std. Error**	**T-value**	**P-value**
Assessment -> English Language Proficiency	0.270	0.089	3.033	0.001*
Assessment -> Technical Communication	0.316	0.075	4.196	0.000*
Content of Learning -> English Language Proficiency	0.403	0.103	3.911	0.000*
Content of Learning -> Oral Presentation	0.915	0.019	48.722	0.000*
Content of Learning -> Social Literacy	0.941	0.011	86.011	0.000*
Content of Learning -> Technical Communication	0.186	0.101	1.852	0.032**
English Language Proficiency -> Technical Communication	0.231	0.085	2.720	0.003*
Method -> English Language Proficiency	0.012	0.089	0.132	0.448^{NS}
Method -> Technical Communication	0.043	0.082	0.522	0.301
Objective -> English Language Proficiency	-0.062	0.096	0.646	0.259
Objective -> Technical Communication	0.154	0.068	2.249	0.012**

Technical Communication -> Learning Environment	0.905	0.015	61.191	0.000*
Technical Communication -> Teaching Competency	0.958	0.007	130.550	0.000*

***p<0.01, **p<0.05**

Based on the above results, it is relevant to conclude that the null hypotheses ($H1_0$: The pertinent objective has no positive and significant effect on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges, $H2_0$: The pertinent content of learning has no positive and significant effect on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges, and $H4_0$: The pertinent assessment method has no positive and significant effect on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges) for relationship between exogenous variables and Technical Communication were rejected, except for Method ($H3_0$: The pertinent method of delivery has no positive and significant effect on technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges).

The relationships of Assessment and English Language Proficiency, in predicting Technical Communication were significant at 1% level. On the other hand, the relationships of Objective and Content of Learning in predicting Technical Communication were significant at 5% level.

The level of R2 assessment. The result of level of R^2 assessment in Table 6.22 below indicated that the R^2 value for Technical Communication was 0.526. The R^2 value was substantial based on Cohen's (1988) criterion to describe the model's predictive accuracy. However, according to Hair et al (2017) and Garson (2016), this value is considered as moderate predictive accuracy. Hence, it can be concluded that the amount of variance of Technical Communication variable explained by all exogenous variables was at moderate level (Garson, 2016; Hair et al., 2017).

Table 6.22

Level of R^2 assessment for structural model.

	R Square
Technical Communication	0.526

The effect size (f2) assessment. The result of effect size (f^2) assessment, as presented in Table 6.23 indicated that all exogenous constructs have small effect size (0.027 to 0.116, above 0.02) in producing R^2 for Technical Communication, except for Method (f^2=0.002) which was below small effect size value (0.02) (Cohen, 1988).

Table 0.23

Effect size (f^2) assessment for structural model.

	Technical Communication
Assessment	0.116
Content of Learning	0.027
English Language Proficiency	0.075
Method	0.002
Objective	0.032

Hence, it is relevant to conclude that Assessment (f^2=0.116, the highest), English Language Proficiency (f^2=0.075), Objective (f^2=0.032) and Content of Learning (f^2=0.027) have small effect size in producing R^2 for Technical Communication.

Predictive relevance (Q2) assessment. The result of predictive relevance (Q^2) assessment in Table 6.24 below showed that the value was 0.316, larger than cut-off value of 0.00 (Cohen, 1988). This indicates that the model is predictive by exogenous variables in this study.

Table 6.24

Predictive relevance (Q^2) assessment for structural model.

	SSO	**SSE**	**Q^2 (=1-SSE/SSO)**
Technical Communication	2,050.00	1,402.44	0.316

The final structural model is illustrated in Figure 6.3 below.

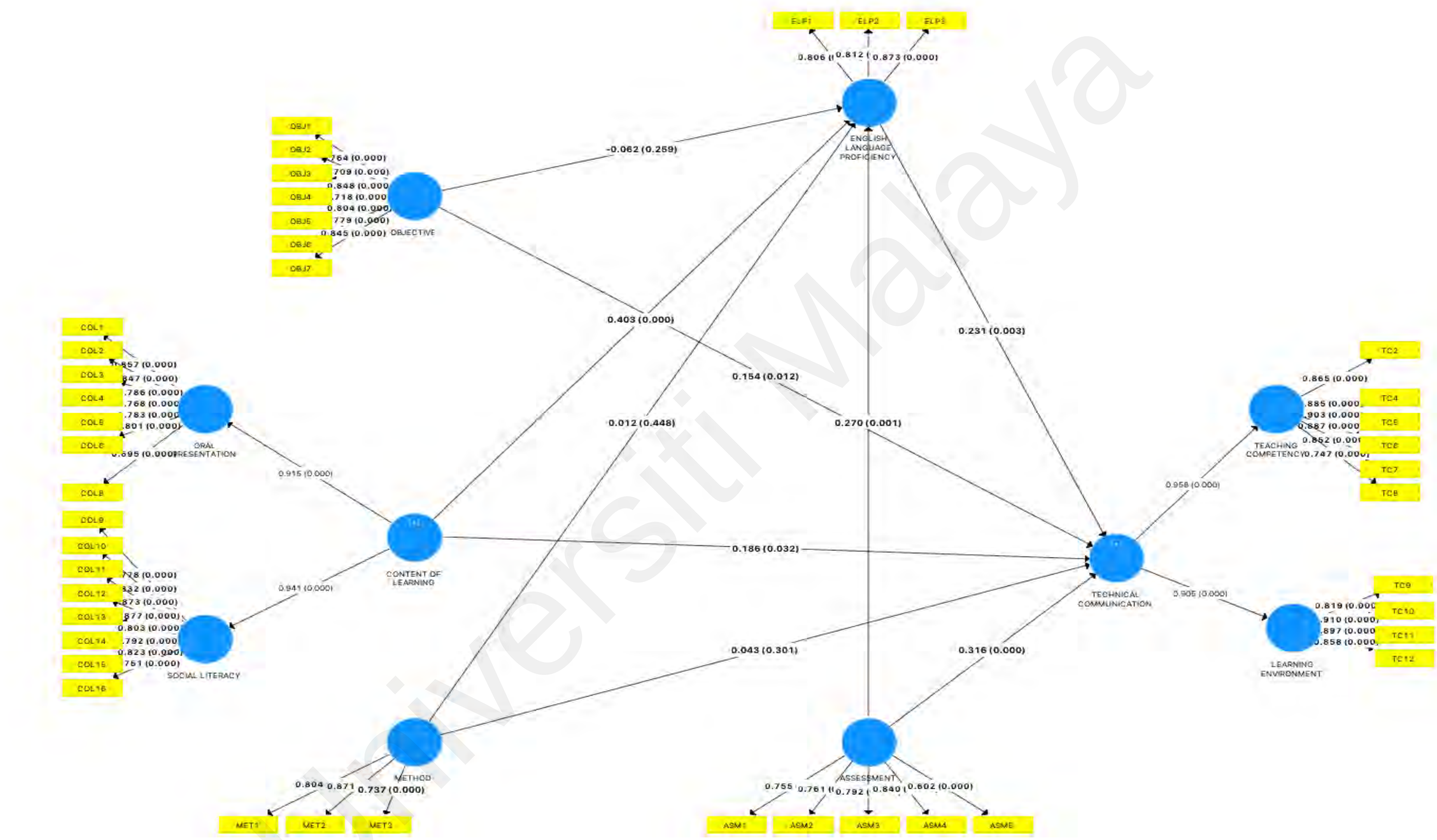

Figure 6.3 The structural model.

In short, after the analysis of structural model, it is relevant to conclude that the structural model has: a) no multicollinearity issue (VIF>5), b) achieved significant relationships between exogenous and endogenous variable ($t>1.96$, $p<0.05$), except for Method, c) substantial predictive accuracy ($R^2>0.26$) according to Cohen (1989) but is considered moderate by Hair et al. (2017) ($R^2>0.5$ for moderate, and $R^2>75$ for substantial), d) small effect size for all constructs in explaining Technical Communication, except Method (lower than 0.02 f^2 value), and e) acceptable predictive relevance (Q^2) value of 0.316, indicating acceptable predictive relevance of all exogenous constructs to explain Technical Communication. Based on the results of R^2, effect size and predictive relevance assessment, there were adequate evidences to conclude that the proposed technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges has achieved moderate predictive accuracy, small effect size and acceptable predictive relevance, indicating that the model is relevant to serve as a reference for technical communication skills development in Malaysian Vocational Colleges settings, and thus answering the research question two (What are the pertinent elements of technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges?). The summary of overall analysis (with indicators) is presented in the following table (Table 6.25).

Table 6.25

Summary of overall analysis.

Indicator	Item	Loading	α	CR	t	f^2
	Objective		0.895	0.917	2.249**	0.032
OBJ1	The objective/focus of technical communication pedagogical model is to develop oral communication skills* that are relevant to the industry. *refers to ability to understand audience and develop content of communication to suit the purpose of communication.	0.764				
OBJ2	The objective/focus of technical communication pedagogical model is to develop written communication skills* that are relevant to the industry. *refers to ability to design and present ideas in the form of written text.	0.709				
OBJ3	The objective/focus of technical communication pedagogical model is to develop interpersonal skills* that are relevant to the industry. *refers to working-in-team skills (such as to give instruction, constructive feedbacks, establish relationship, and share information, and to have awareness of different cultural background of speakers).	0.848				

OBJ4	The objective/focus of technical communication pedagogical model is to develop researching skills* that are relevant to the industry. *refers to ability to retrieve, evaluate, and apply information for communicative purposes.	0.718				
OBJ5	The objective/focus of technical communication pedagogical model is to provide work-related communicative experiences for students.	0.804				
OBJ6	The objective/focus of technical communication pedagogical model is to guide teaching and learning for communication skills in technical field.	0.779				
OBJ7	The objective/focus of technical communication pedagogical model is to expose students with authentic communicative experiences in the real settings of the industry.	0.845				
	Content of Learning		0.944	0.950	1.852**	0.027
	Oral Presentation		0.900	0.922		
COL1	The ability to retrieve relevant information* is important to be emphasized in the content of learning. *refers to a process of gathering information from multiple sources that is related to a topic.	0.857				

COL2	The ability to gather and organize relevant information is important to be emphasized in the content of learning. *refers to a process of sorting resources so that it will ease the process of reading and understanding.	0.847
COL3	The ability to distinguish main ideas from supporting details is important to be emphasized in the content of learning.	0.786
COL4	The knowledge on how to operate technological tools* to improve communication is important to be emphasized in the content of learning. *refers to the knowledge of which technological tools that can be used to gather valuable information and enhance communication to reach a larger audience.	0.768
COL5	An awareness of how technological tools help to promote social-interactions and collaboration at work is important to be emphasized in the content of learning.	0.783

COL6	The ability to plan and develop the content* of oral presentations is important to be emphasized in the content of learning. *refers to process of developing content of communication to suit audience background.	0.801
COL7	The ability to plan and prepare visual aids* (for larger audience) is important to be emphasized in the content of learning. *refers to the utilization of videos or pictures to enhance the delivery of content.	**deleted**
COL8	The ability to plan an introduction and conclusion* of oral presentations is important to be emphasized in the content of learning. *refers to the process of acknowledging the audience by addressing them accordingly (protocol/salutation) and to summarize the content to reinforce the points.	0.695

			0.928	0.941
	Social Literacy			
COL9	The ability to communicate effectively with co-workers and administrators is important to be emphasized in the content of learning.	0.778		
COL10	The ability to effectively give instructions is important to be emphasized in the content of learning.	0.832		
COL11	The ability to give constructive feedbacks is important to be emphasized in the content of learning.	0.873		
COL12	The ability to establish professional relationships with customers and co-workers is important to be emphasized in the content of learning.	0.877		
COL13	The ability to share information in small group settings is important to be emphasized in the content of learning.	0.803		
COL14	The multicultural awareness is important to be emphasized in the content of learning.	0.792		

COL15	The ability to positively handle conflicts* within groups is important to be emphasized in the content of learning. *refers to the process of identifying issues (between group members and with the management), understand them and resolving them.	0.823
COL16	The leadership skills* are important to be emphasized in the content of learning. *refers to the ability to listen to co-workers/team members and explain working goals, expectations and specific task to be completed as a team.	0.751
COL17	The ability to produce business letters* is important to be emphasized in the content of learning. *refers to a formal text that is used to convey important information for work purposes, such as application letters, data sheet, recommendation letters, complaint letter and business emails.	**deleted**

	Method		0.727	0.847	0.522^{NS}	0.002
MET1	Practical tutorial is a relevant method of delivery to develop students' technical communication skills.	0.804				
MET2	Collaborative learning activity is a relevant method of delivery to develop students' technical communication skills.	0.871				
MET3	Field training is a relevant method of delivery to develop students' technical communication skills.	0.737				
MET4	Communication module which introduces technical communication across technical subjects is a relevant method of delivery to develop students' technical communication skills.	**deleted**				
MET5	Communication across curriculum (integrates technical communication skills across technical subjects) is a relevant method of delivery to develop students' technical communication skills.	**deleted**				
MET6	Contextualized learning activity (which is conducted in an authentic working environment) is a relevant method of delivery to develop students' technical communication skills.	**deleted**				

	Assessment		0.806	0.867	4.196*	0.116
ASM1	Oral presentations are relevant to help assess students’ technical communication skills.	0.755				
ASM2	Writing technical document tasks are relevant to help assess students’ technical communication skills.	0.761				
ASM3	Observation on students’ communicative experiences during field work training are relevant to help assess students’ technical communication skills.	0.792				
ASM4	Observation on students’ communicative experiences in group activities / team work projects are relevant to help assess students’ technical communication skills.	0.840				
ASM5	Students’ responses in online forum discussion are relevant to be observed to help assess students’ technical communication skills.	0.602				
	Technical Communication		0.940	0.949		
	Teaching Competency		0.927	0.943		
TC1	The pedagogical model will help to improve teachers’ understanding of relevant communication skills to the current industry.	**deleted**				
TC2	The pedagogical model will help to improve teachers’ understanding of	0.865				

	important communication skills to be integrated in teaching.	
TC3	The pedagogical model will help to improve teachers' understanding in organizing relevant teaching and learning activities in classroom.	**deleted**
TC4	The pedagogical model will help to guide teacher in organizing teaching objectives in teaching communication skills that are relevant to the current industry.	0.885
TC5	The pedagogical model will help to guide teacher in organizing the relevant content of learning in teaching communication skills that are relevant to the current industry.	0.903
TC6	The pedagogical model will help to guide teacher in selecting appropriate teaching delivery method in teaching communication skills that are relevant to the current industry.	0.887
TC7	The pedagogical model will help to guide teacher in selecting appropriate assessments in teaching communication skills that are relevant to the current industry.	0.852
TC8	The pedagogical model will help to encourage students to practice communication skills for work in an authentic learning environment.	0.747

			0.894	0.927		
	Learning Environment					
TC9	The pedagogical model considers students' prior knowledge in developing communication skills for work.	0.819				
TC10	The pedagogical model is appropriate to students' prior communicative experiences in classroom.	0.910				
TC11	The pedagogical model is appropriate to students' prior communicative experiences during field work.	0.897				
TC12	The pedagogical model will help to encourage students to practice communication skills for work during instruction hour.	0.858				
	English Language Proficiency		0.776	0.870	2.720*	0.075
ELP1	The ability to construct accurate sentence structure in writing is important to the development of communication skills for work.	0.806				
ELP2	The ability to apply appropriate verbal communication strategy in a conversation is important to the development of communication skills for work.	0.812				
ELP3	The ability comprehend information in a text in English language is important to the development of communication skills for work.	0.873				

***p<0.01, **p<0.05, ^{NS}Not Significant**

Mediation analysis

Mediator is a variable that has an effect on the relationship between independent and dependant variable (Awang, 2015). As established earlier (Chapter 2), English Language Proficiency is believed to mediate the relationship between all four exogenous constructs (Objective, Content of Learning, Method and Assessment) and Technical Communication. This means that ELP might have an effect on these relationships when it is included in this model. In order to confirm this, mediation analysis was conducted. If the results suggest that ELP is a mediator, this means that ELP should be also considered in the technical communication skills development.

In this study, the procedure of this analysis was adopted from Zhao, Lynch, and Chen's (2010) work, where they systematically provided guidelines in determining the mediation effects. They categorized mediation effects into two: a) full, and b) partial mediation (complementary and competitive partial mediation). Ramayah et al. (2018) explained that full mediation occurs when the indirect effect is significant but not the direct effect. On the other hand, partial mediation occurs when both indirect and direct effect are significant. However, if the sign of a x b x c' is positive, it is considered as complementary, but if negative, it is competitive.

For this study, the significance of the indirect effect for both Content of Learning (t=2.376, p=0.009) and Assessment (t=1.875, p=0.030) were significant (refer Table 6.26). The direct effect for both constructs were also significant, where Content of Learning has achieved the t value of 1.852 and p value of 0.032, and Assessment has achieved the t value of 4.196 and p value lower than 0.001. Next, the sign of a x b x c' for both Content of Learning and Assessment were all positive, indicating that complementary partial mediation exists. This also means that the effect of Content of Learning and Assessment is mediated by English Language Proficiency. However, Content of Learning and Assessment are still able to explain a portion of Technical Communication, without English Language Proficiency. Therefore, the null hypothesis for mediation effect of English language proficiency on the relationship between Content of Learning and Assessment, with Technical Communication ($H6_0$: The relationship between pertinent content of learning and technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is not positively mediated by English language proficiency, and $H8_0$: The relationship between pertinent assessment method and technical communication pedagogical model for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is not positively mediated by English language proficiency) were rejected.

Table 6.26

Mediation analysis result.

	B	SE	T-value	P-value
Path a				
Objective -> English Language Proficiency	-0.062	0.096	0.646	0.259
Content of Learning -> English Language Proficiency	0.403	0.103	3.911	0.000*
Method -> English Language Proficiency	0.012	0.089	0.132	0.448
Assessment -> English Language Proficiency	0.270	0.089	3.033	0.001*
Path b				
English Language Proficiency -> Technical Communication	0.231	0.085	2.720	0.003*
Path c'				
Objective -> Technical Communication	0.154	0.068	2.249	0.012**
Content of Learning -> Technical Communication	0.186	0.101	1.852	0.032**
Method -> Technical Communication	0.043	0.082	0.522	0.301
Assessment -> Technical Communication	0.316	0.075	4.196	0.000*

Total Effect				
Objective -> Technical Communication	0.140	0.077	1.809	0.035**
Content of Learning -> Technical Communication	0.280	0.096	2.908	0.002*
Method -> Technical Communication	0.045	0.089	0.508	0.306
Assessment -> Technical Communication	0.379	0.077	4.900	0.000*
Indirect Effect				
Objective -> English Language Proficiency -> Technical Communication	-0.0140	0.0260	0.560	0.288
Content of Learning -> English Language Proficiency -> Technical Communication	0.0930	0.0390	2.376	0.009*
Method -> English Language Proficiency-> Technical Communication	0.0030	0.0210	0.129	0.449
Assessment -> English Language Proficiency -> Technical Communication	0.0620	0.0330	1.8750	0.030**

*p<0.01, **p<0.05

On the other hand, the Objective (t=0.560, p=0.288) and Method (t=0.129, p=0.499) were both have insignificant indirect effect. However, Objective has achieved a significant direct effect, where the t value was 2.249 and p value was 0.012. This indicates that Objective only has direct effect with no mediation effect. Therefore, the null hypothesis for mediation effect of English language proficiency on the relationship between Objective and Technical Communication ($H5_0$: The relationship between pertinent objective and technical communication pedagogical model for technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is not positively mediated by English language proficiency) was accepted. On the other hand, Method has achieved insignificant direct effect, where the value was 0.522, and p value was 0.301. This indicates that Method has no effect on Technical Communication and mediation effect. Hence, the null hypothesis for mediation effect of English language proficiency on the relationship between Method and Technical Communication ($H7_0$: The relationship between pertinent method of delivery and technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges is not positively mediated by English language proficiency) was accepted, and thus answering the research question three.

This study has provided an interesting finding. The ELP is found to be important to technical communication skills development, especially for Content of Learning and Assessment Method. Therefore, it is important to give attention to ELP in developing a sound content and assessment measures in implementing technical communication courses in Malaysian Vocational Colleges.

Conclusion

In conclusion, all variables are found to have a positive and significant effect on an industry-based technical communication skills pedagogical model for Malaysian Vocational Colleges, except for Method of Delivery. The findings of mediation analysis indicated that English Language Proficiency plays a role as complementary partial mediator for relationship between both Content of Learning and Assessment Method and Technical Communication.

CHAPTER 7

DISCUSSION AND CONCLUSION.

Introduction

The main objective of the current study is to propose an industry-based technical communication pedagogical model for Malaysian Vocational Colleges. This idea was initially established from the gap of literature, where: a) major impediments to employment is poor communication skills (Mourshed, Patel & Suder, 2014; Nagendra et. al, 2013; Oxtoby, 1997; Tabbron & Yang, 1997) especially in English, b) the outcomes of TVET institutions are still inadequate to produce skilled workers with a strong foundation of communication skills (Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997; Tabbron & Yang, 1997), and c) even though technical communication skills development is potentially beneficial to overcome this situation, the current landscape of technical communication delivery is still problematic (Reaves, 2004). Therefore, the current study is aimed to develop a sound pedagogical model in implementing technical communication skills development in Malaysian context.

Identifying the Key Determinants of an Industry-Based Technical Communication Skills Pedagogical Model for Malaysian Vocational Colleges from Industry and TVET Experts' Perspectives.

In answering the first research question (What are the key determinants of technical communication pedagogical model for an industry-based Malaysian in Vocational Colleges from industry and TVET experts' perspectives?), this study has employed fuzzy delphi method, with selected 17 experts from industry and TVET institutions. The experts agreed on almost all suggestions for every curriculum component (objective, content of learning, method of delivery and assessment) as well as the importance of technical communication pedagogical model and English language proficiency. However, what is worth being highlighted here is the suggestions for content of learning. Based on the extensive review of literature, there were four main skills that should be emphasized for the model: a) oral technical, b) written technical, c) interpersonal and d) researching skills (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane & Gibson, 1997; Male, Bush & Chapman, 2011). However, these experts rejected almost all sub skills of the technical writing skills. Only two sub-skills (the ability to produce business letters and technical journalism) were accepted. This is not a surprising fact as the current focus of teaching and learning for written communication skills in Malaysian Vocational Colleges is only to develop basic note-taking, summarizing and ability to produce basic written documents for target audience (MOEM, 2014a). In fact, one of the experts specifically mentioned that for local industry, only basic written skills, such as ability to produce business letters or emails, are expected among graduates of Vocational Colleges. However, the ability to produce technical journalism was found to be beneficial as this will help students if they are interested to further their study in tertiary education level. This is supported by one of the TVET academician, where he specifically mentioned that this skill is

"…common in (any) MTUNs, Universities and Polytechnics." (AC2).

In the pilot study, the developed instrument (based on the findings of fuzzy delphi) was piloted on 100 English language instructors in selected Vocational Colleges in Peninsular Malaysia. Through EFA, the psychometric properties of the instrument were explored through analysis of pairwise relationships of individual variables and extraction of latent factors (Osborne, 2014; William et al., 2010). Interestingly, the findings suggested that the dimensions of content of learning variables were reduced into two: a) social literacy skills and b) oral presentation skills (based on the Kaiser's (1960) criterion, eigenvalue larger than 1). Based on the responses of English language instructors, one of the sub-skills of written technical communication skills (the ability to produce technical journalism) was omitted due to low correlation and loading value. This indicates that this skill is insignificant for content of learning of technical communication skills. This is contradicting to what the experts have suggested. However, in the context of Malaysian Vocational Colleges, the ability to produce technical journalism is not the emphasis in the current curriculum. This is because at this stage, students need to acquire basic writing skills (MOEM, 2014a) before they are able to develop higher competency in producing technical journalism, which is a higher level of writing skills and not expected at Vocational College level.

Other than content of learning, the experts (in fuzzy delphi phase) have agreed that the relevant method of delivery in Malaysian Vocational Colleges settings were collaborative learning, field training, contextualized learning activities, practical tutorial, expert feedbacks, communication across curriculum, communication module and online learning activities. However, based on the response and analysis in EFA, two items were omitted: online learning activity and expert feedback. Online learning activity in developing technical communication skills in TVET institution is found to be beneficial in a number of literature (Cook, 2002; Lappalainen, 2010; McMurrey, 2002). In fact, in Cook's (2002) description of prominent technical communication skills, technological literacy is one of the important skills that should be exposed to students. This is because he believes that online interaction is vital in the current working settings. However, in the context of Malaysian Vocational Colleges, this method is not widely accepted, based on the findings in this study. Possibly, the issue of limited allocation for academic component (30% of total instructional hours) in the current TVET implementation in Malaysia (MOEM, 2012) has made English language instructors struggle to implement ICT in teaching and learning and to juggle between preparation for examinations and providing more supportive learning settings. In a metanalysis of 14 studies in the area of Malaysian TVET implementation conducted by Ismail, Nopiah, Rasul and Leong (2017), they found that ICT implementation is lacking in our institutions. They mentioned that this situation might be resulted from overbearing work commitment of teachers in these institutions. Similarly, other researchers such as Mahmud and Ismail (2010) and Alazam, Bakar, Hamzah and Asmiran (2012) agreed that overbearing commitment of work has resulted in poor ICT implementation in Malaysian TVET institutions.

Similarly, the expert feedback was also omitted as one of the methods of delivery, based on the finding of this study. In the context of technical communication development in USA and Canada, Reaves (2004) mentioned that employing expert feedbacks in assessing students' projects is vital. This is because the feedback is given not only by English language course instructors but also by instructors from Engineering departments, in order to ensure that the students are able to deliver content of project using accurate language based on their specialization. However, in the context of Malaysian Vocational Colleges, this method seems to be slightly ambitious. In the current practice of teaching and learning, the curriculum for English component does not majorly focusing on course specialization or providing vast opportunity for students to learn and apply communication skills in specific working settings. Previously, it has been discussed that the current curriculum is majorly focusing on developing basic language skills (reading, writing, listening and speaking) (MOEM, 2014a). In fact, Johns and Dudley-Evans (1991) critiqued that the subject such as

General English is majorly focusing on developing four language skills and slightly has overlooked the needs to develop communication skills that are very specific to occupational needs. Within the limitation of current curriculum of English in Malaysian Vocational Colleges, the instructors only follow what has been highlighted in the curriculum and thus, their teaching majorly focuses on developing basic language skills and is being delivered in a limited time allocation per week. Therefore, to employ expert feedbacks in this subject is a challenge.

On the other hand, the findings of fuzzy delphi suggested that observation on students' communicative experiences in group activities / team work projects and during fieldwork, oral presentations, students' responses in online forum discussion, and terminology exams are relevant to help assess students' technical communication skills. However, based on the EFA result, the terminology exam was omitted due to low correlation and loading value. This is an unsurprising fact because in the current curriculum for English in Malaysian Vocational Colleges, MOEM (2014a; 2014b) has specifically mentioned that in Semester 4, students' ability to apply all four language skills including information-gathering skills will be assessed through various assessment tasks that are more authentic such as tasks that are related to the field works and apprenticeships. Therefore, it is relevant to state that terminology exam is not relevant to the implementation of the current curriculum. In addition, in the current framework of Malaysian TVET assessment, hands-on assessment is more relevant to further help develop students' technical and employability skills (Alias, DeWitt &Jamaludin, 2018). The shift from traditional assessment, such as examination to practical work-based assessment, is one of the major shifts in Malaysian Skill Certification Qualification framework (Yunos et al., 2006).

In short, the findings of the first research objective through fuzzy delphi have highlighted the direction of how technical communication pedagogical model should be developed. In Tyler's (1949) curriculum planning model, the four components of curriculum (objective, content of learning, method of delivery and assessment method) should be designed not only to address the needs of students but also with consideration of experts' opinions in fulfilling its aims. In this study, an extensive review of literature on these potential sub items for each component have been presented to experts from both industry and TVET institutions. These experts have expressed their opinion and consensus was achieved on prominent components for this pedagogical model. Clearly, this is in line with what Tyler's (1949) stated as an organized way of developing a sound curriculum.

Proposal for an Industry-Based Technical Communication Skills Pedagogical Model for Malaysian Vocational Colleges.

In answering the second research question: what are the pertinent elements of technical communication pedagogical model for an industry-based in Malaysian Vocational Colleges according to vocational college instructors? survey questionnaires were administered on 205 English language instructors in Malaysian Vocational Colleges. The data was later analyzed using SmartPLS, with a number of assessments in order to identify and conclude the prominent elements for objective, content of learning, method of delivery and assessment method, as well their relationships with technical communication pedagogical model. In previous chapter (Chapter 5), the results of multicollinearity, significance of relevance, R^2, effect size and predictive relevance assessments were presented. It is found that almost all components have a significant contribution (Objective, p=0.012, t=2.249; Content of Learning, p=0.032, t=1.852;

Assessment, p=0.000, t=4.196) to the importance of technical communication pedagogical model, except for Method (p=0.301, t=0.522). For objective, all suggested objectives from the needs analysis were acceptable and significant to the importance of technical communication pedagogical model. These objectives concern on developing all dimensions of technical communication skills, providing work-related and authentic communicative experiences, as well as serving as a clear guideline for instructors are found important for implementation in Malaysian Vocational Colleges. The importance of designing lessons to encourage technical communication skills development with exposure to work-related and authentic communicative experiences has been deliberately discussed in literature. For instance, Wellington (1993) firmly believes that providing students with work-based activities is an important platform to prepare them for the job. Also, what has been proposed as the objectives of the pedagogical model, are in line with the needs to overcome poor communication skills among graduates, especially form TVET instructions (Mourshed et al., 2014; Nagendra et. al, 2013; Oxtoby, 1997; Tabbron & Yang, 1997).

For the content of learning, even though initially there were four major skills that were relevant to be emphasized in teaching and learning (from experts' perspectives), the findings in the pilot and second phase analysis indicated that written technical communication skills were less important for Malaysian Vocational Colleges students. The other three components were merged and formed oral presentation and social literacy skills, based on the EFA result and theoretical explanation as described in the work of Cook (2002) and Nutman (1987). The findings of significance of relationships in SmartPLS suggested that almost all subskills of researching skills (retrieve, gather and organize information, distinguish main ideas in a text and awareness of how technological tools help to promote interactions) and two sub skills of oral technical communication (plan introduction and conclusion, and plan relevant content) were accepted and significant. Also, for social literacy skills, all subskills (communicate and establish relationship with customer and co-workers, give instruction and constructive feedbacks, and multicultural awareness) were accepted and significant.

An interesting finding of this study is how the ability to produce business letters and technical journalism (under written technical communication skills) was seen as insignificant for Malaysian Vocational Colleges. However, this is an unsurprising fact because in the fuzzy delphi, the experts have addressed how these skills are only relevant if the graduates interested to further their study in tertiary education level. Also, one of the industry experts mentioned that the graduates are not expected to complete complex written tasks in real industry settings. Recent studies such as by Rasul, Rauf, Mansor, Yasin and Mahamod (2013) and Muda, Din, Majid, Ahmad, Shahabudin, Rambely, and Suradi (2012) have similarly suggested that the employers in the local industry only expected basic reading and writing skills among TVET graduates. However, other skills such as interpersonal, social skills and multicultural awareness are highly valued by employers in our local industry settings (Muda et al., 2012; Rasul et al., 2013; Singh, Thambusamy & Ramly 2014; Zaharim, Ahmad, Yusoff, Omar, & Basri, 2012). This is in line with the findings of current study. Therefore, it is important to develop both oral presentation and social literacy skills in Malaysian Vocational Colleges.

For assessment method, all items (oral presentation, writing technical documents, as well as observation on students' communication during group work, field training and online forum) in this variable were accepted except terminology exam. In an extensive review of assessment in Malaysian education context, Singh et al. (2012) have criticized the use of examination as an indicator to measure students' success. They elaborated that the pen-and-paper test only provides a facet of students' knowledge and ability within a limited assessment period. In the current practice in TVET institutions, Department of Skills Development Malaysia (2016) mentioned that the assessment is conducted in two forms: theoretical (40%) and practical assessment (60%). In the context of Malaysian Vocational Colleges, a study by Rahman, Hanafi, Mukhtar and Ahmad (2014) found that the formal examination is not an ideal assessment to measure students' overall ability and performances, especially on their employability skills including technical communication skills. They firmly believed that competency-based assessment, which assessing students in authentic or job-based tasks, is more appropriate to help assess and develop students' mastery and skills application. Clearly, the findings of the current study are in line with Rahman et al.'s (2014) suggestion. The assessment methods for technical communication are more towards competency-based assessment, where students' communicative experiences and participations are being assessed in job-based tasks such as presentation of their projects and other communicative activities via face-to-face and online forum.

Nevertheless, the findings of significance of relationships for Method of Delivery was insignificant (p=0.301, t=0.522). This is an interesting finding because in the SEM analysis, only three methods of delivering technical communication (through practical tutorial, collaborative learning activities and field training) were accepted, with factor loading above 0.70 (Henseler et al., 2009). Theoretically, these three methods are found to be relevant in delivering technical communication in TVET institutions. Reaves (2004) and other researchers (Lappalainen 2010; Laverty, 1979) have suggested that practical tutorial and collaborative learning activities are important to help students develop all skills of technical communication. They further elaborated that students will be given ample time during practical tutorial to work collaboratively in completing their projects and seek advice from their instructor. The other technical communication skills such as researching and working-in-group skills can also be developed simultaneously during tutorial. However, in this study, the finding is in opposite. One possible explanation to this situation lies in the current structure and implementation of English communicative subjects in Malaysian Vocational Colleges. In the 10^{th} Malaysia Plan, one of the major emphases for TVET education is to streamline the methods of delivery by introducing e-learning, expanding ICT use in education and blended learning (Economic Planning Unit, 2010). Ironically, in the current study, online learning activity was not accepted by English language instructors as one of the delivery methods for technical communication development. Possibly, as highlighted by Mahmud and Ismail (2010) and Alazam et al. (2012), the overbearing workloads of instructors have resulted in the reluctance to implement ICT-based learning in Malaysian TVET institutions. Abdullah and Majid (2013) supported that English language instructors typically are juggling between teaching and clerical works in TVET institution and thus effecting their teaching delivery. Hence, they opted to conduct teaching in a less innovative manner as they have limited time to prepare quality teaching (Abdul-Wahab,. Zakaria & Jasmi, 2010). On top of that, with numerous new suggestions to improve methods of teaching and learning in TVET institutions (such as e-portfolio, ICT-based learning and blended learning) as outlined in the 10^{th} Malaysia Plan (Economic Planning Unit, 2010), there is still a problem with its implementation and monitoring as a number of TVET providers are involved in this process (Hassan, Razzaly & Alias, 2012). As the result, the teaching and learning in our TVET institutions are slightly in unorganized state. Hassan, Razzaly and Alias (2012) affirmed that TVET instructors' competency should first be improved. In achieving the aspiration to produce skilled workers for our country, the instructors should be able to provide teaching and learning there are no longer traditionally oriented. In addition, as explained by Abdullah and Majid (2013), the English language instructors are facing challenges in delivering English language subjects in TVET institutions. In the current teaching settings, English language instructors have to abide to different curriculum modules depending on year of intake and levels of certification of students. This situation has placed English language instructors in such pressure to fulfil the outcomes of curriculum and higher examination grades, and at the same time to ensure students are able to apply effective communication (MOE 2014a; 2014b). Abdullah and Majid (2013) argued that the implementation of an English language module that works across different disciplines of work is a challenge for instructors to provide authentic communicative experiences for students. Hence, this situation might have resulted in their decision to employ traditional teaching method in delivering the content of learning.

Evaluating the Effect of English Language Proficiency on the Development of Industry-Based Technical Communication Skills Pedagogical Model for Malaysian Vocational Colleges.

In this study, the mediation effect assessment was conducted to evaluate the effect of perceived importance of English language proficiency on technical communication pedagogical model components. It was found that English language proficiency only functioned as complementary partial mediator for both Content of Learning ($t=2.376$, $p=0.009$; $t=1,852$, $p=0.032$) and Assessment ($t=1.875$, $p=0.030$; $t=4.196$, $p=0.000$). According to Ramayah et al. (2018), the variables that have complementary partial mediator are still able to explain endogenous variable even without mediator. For this study, it can be concluded that the of perceived importance of English language proficiency only complementary or partially affect the relation between Content of Learning and Assessment with the perceived importance of technical communication pedagogical model. On the other hand, Objective and Method of Delivery has no mediation effect.

The importance of English language proficiency to technical communication skills development has been extensively discussed in literature. The concept of technical communication stems from the concept of English for specific purpose (ESP). Strevens (1988) explained that ESP has both absolute and variable characteristics. Absolute characteristics refer to how ESP is used as the guideline for teaching implementation, such as addressing leaners' specific needs of language learning, as well designing content of learning and lesson to help students' acquired the desired language for specific occupation needs. The variable characteristics describe how English language proficiency development is embedded in teaching and learning rather than explicitly teach language itself. Regardless, the proficiency in English still plays an important role in ensuring that students are able to apply ESP in real working environment, such as in oral and written technical communication, interpersonal and researching skills (Brinkman & van der Geest, 2003; Laverty, 1979; McMurrey, 2002; Nutman, 1987). In fact, in the communication process model (Dean & Bryson, 1961), English language proficiency is viewed as an important component in "language system" that plays an important role to effective communication.

In this study, since the content of learning and assessment concern on the production of language skills, the importance of English language proficiency is therefore undeniable to effective technical communication development. Previous studies on technical communication skills development such as by Brinkman and van der Geest (2003), Cook (2002) and Lappalainen (2010), have highlighted the proficiency in English might play an important role in technical communication skills development. Similarly, the current study found that English language proficiency has contributed to the relationship between content of learning and assessment method with the importance of technical communication pedagogical model. However, as the result of mediation effect suggested, the importance of English language proficiency (that concerns on ability to use accurate sentence structure, apply appropriate verbal communication strategy and comprehend information) only functions as a partial mediator. This is in line with what Strevens (1988) has described as variable characterizes of ESP. Hence, in the implementation of the pedagogical model, even though English language proficiency is not a full mediation, it is also important to give attention to the development of students' ability to use accurate sentence structure, apply appropriate verbal communication strategy and comprehend information, along with other sub skills accepted as part of technical communication skills development.

Evaluating the Overall Contribution of All Curriculum Components on Industry-Based Technical Communication Skills Pedagogical Model for Malaysian Vocational Colleges.

In evaluating the overall contribution of all curriculum components on industry based technical communication pedagogical model for Malaysian Vocational Colleges, the level of R^2, effect size (f^2), and predictive relevance (Q^2) test were conducted. Firstly, the level of R^2 assessment was conducted to determine the model's predictive accuracy (Garson, 2016), and the result indicated the R^2 value was 0.526. This value is considered moderate predictive accuracy according to Hair et al. (2017) and Garson (2016). Secondly, the effect size (f^2) assessment was conducted to measure unexplained variance by the change in R^2 in the model (Hair et al., 2014). The result indicated that all exogenous constructs have small effect size in producing R^2 for the importance of technical communication pedagogical model, except for method of delivery with only f^2 value of 0.002. This value is lower than 0.02 (small effect size) as suggested by Cogen (1988). Lastly, the predictive relevance using (Q^2) test was also conducted. Cohen (1988) noted that if the value is above than 0.000, this indicates that model has predictive relevance. In this study, the Q^2 value was 0.316, indicating that the model has predictive relevance.

Based on the above results, all components of curriculum are relevant in explaining the importance of technical communication pedagogical model, except for method of delivery with effect size lower than small effect size (lower than cut-off value of 0.02).

Undoubtfully, the objectives of the pedagogical model were derived from Wellington's (1993) workplace-school competencies and foundation skills framework, technical communication theory (Mitchel, 1962) and frameworks (Brinkman & van der Geest, 2003; Cook, 2002; Laverty, 1979; McMurrey, 2002; Nutman, 1987; Reaves, 2004; Rus, 2014) and components of a sound pedagogical model (Glaser, 1962; Hallam & Ireson, 1999). These theories and frameworks serve as the basic on what a sound technical communication pedagogical model should include and focus on. The findings of this study suggested that other than focusing on social literacy and oral presentation skills. The objectives should also consider the importance of authentic communicative experiences and providing a clear guideline for English language instructors to implement technical communication in the context of Malaysian Vocational Colleges. This is in line with the concept of a sound pedagogical model, where Glaser (1962) and Hallam and Ireson (1999) emphasized that an effective teaching and learning comes from teacher's understanding of teaching and learning environment of students.

Secondly, in designing the content of learning that is relevant to develop technical communication, an extensive focus should be given on developing social literacy and oral presentation skills. The social literacy skills cover what was initially called interpersonal skills (before EFA). The ability to communicate and establish relationship with customer and co-workers, give instruction and constructive feedbacks, and multicultural awareness are important based on the findings of the current study, and in fact have been highlighted as important skills of technical communication (Brinkman & van der Geest, 2003; Cook, 2002; Laverty, 1979; McMurrey, 2002; Nutman, 1987). In addition, the oral presentation skills, which initially categorized under researching and oral technical communication skills (before EFA) are also important to be developed among students in Malaysian Vocational Colleges. The findings of the current study suggested that the ability to retrieve, gather and organize information, distinguish main ideas in a text and awareness of how technological tools help to promote interactions, plan introduction and conclusion, as well as plan relevant content, should be the focus of teaching and learning to develop technical communication skills. These skills are very important to be developed as these skills will help to contribute to students' technical communication skills and can be expanded to other working competencies that are highly valued by local employers (Muda et al., 2012; Rasul et al., 2013; Singh, Thambusamy & Ramly 2014; Zaharim, Ahmad, Yusoff, Omar, & Basri, 2012).

Even though method of delivery has achieved lower than small effect size, the overall model still has achieved its predictive relevance. Previously, it has been discussed that how the components of method of delivery were not well accepted by

English language instructors in this study. Regardless of the experts' suggestions to include collaborative learning activities, practical tutorial tasks, online learning activities, communication module, communication across curriculum and contextualized learning activities as the method of teaching in developing technical communication skills, the findings of SEM analysis indicated that these methods were insignificant. Possibly, instructors' poor acceptance of proposed method of delivery in this study has a close relationship with the current settings in Malaysian Vocation Colleges. This is because the findings of previous studies have appointed that the overbearing workloads of instructors in TVET institutions, especially for English language instructors have resulted in less innovative teaching method used to teach communication in English (Abdullah & Majid, 2013; Abdul-Wahab,. Zakaria & Jasmi, 2010; Alazam et al., 2012; Mahmud & Ismail, 2010). Hence, in this study possibly they did not prefer non-traditional way of teaching in developing technical communication skills.

Lastly, almost all assessment methods (oral presentation, writing technical documents, as well as observation on students' communication during group work, field training and online forum) were accepted, except terminology examination. The effect size for assessment method was the highest ((f^2=0.116) in producing R^2 for Technical Communication. This indicates that the proposed assessment methods are relevant to be emphasized in developing technical communication skills in Malaysian Vocational Colleges. It is undeniable that assessment methods that focus on application of learned skills are more relevant in order to help develop technical communication skills. In fact, Rahman et al. (2014) supported that competency-based assessment, that evaluates students in term of competencies that are required by the industry is more relevant for TVET institutions. Therefore, there is a need to move away from traditional assessment, such as examination. In this study, the findings similarly supported this claim. Terminology examination which was introduced in Lappalainen's (2010) study seems inappropriate in Malaysian context. In fact, this approach has received a number of critiques on its suitability to develop employability skills in TVET institutions (Rahman et al., 2014; Singh et al., 2012) as it will not appropriate to evaluate overall students' competency and performance, and it only provides limited platform for improvements. Therefore, it is relevant to state the findings of the current study is in line with competency-based assessment that is more relevant to current practice of TVET assessment.

Implications of the Current Study

The current study has several implications to theoretical, methodological basis and practice in developing students' technical communication skills. Firstly, in term of theoretical implication, the current study has filled the gap of literature by proposing technical communication pedagogical model for Malaysian Vocational Colleges. In earlier chapters (Chapter 1 and 2), it has been established that the current literature on technical communication skills development provides limited direction for curricula design in developing these skills (Nagendra et al., 2013). Also, in the localized context of Malaysia the studies on technical communication development are very limited and the current curriculum in Vocational Colleges have overlooked the importance of developing this skill to enhance students' employability skills. Therefore, the current study has considered a number of theories and frameworks on technical communication, industry-based curriculum and curriculum development in developing the model. One of the strengths of this study is how it has considered the opinions of experts from local industry as well as TVET institutions in deciding the sub-components of the curriculum model. This is in line with Reaves (2004) and other researchers (Salazar, Suleski & Coleman, 2001; McGourty, 1999; Seat, Pearsons & Poppen, 2001) as they believed that poor interaction between curriculum designers, instructors and industry experts has resulted in poor implementation of technical communication in TVET institutions.

Furthermore, the importance of English language proficiency has been studied as part of the model development. Proficiency in English is not only an important part in effective communication as reflected in Dean and Bryson's (1961) Communication Process model but is proven to be important element to employability (Bleakly & Chin, 2004; Chiswick & Miller, 2014). The proposed model in this study has highlighted three important English language skills for technical communication development: a) ability to construct accurate sentence structure in writing, b) ability to apply appropriate verbal communication strategy in a conversation, and c) ability comprehend information in a text in English language. Therefore, it is very important in its implementation to embed these skills in teaching and learning in Malaysian Vocational Colleges.

Secondly, in term of methodological implication, this study has proposed two instruments (FDM and survey instrument) and a model based on the responses of the survey instrument. It has been established that the poor mastery of communication-for-work skills among TVET graduate has resulted in poor employment among TVET graduates (Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997). Even disheartening, the curriculum in these institutions seem inadequate to equip students with this skill. In addressing this, the current study employed FDM as a relevant design in establishing experts' consensus on the relevant elements for this model (Siraj et al., 2013). Clearly, the selection of this method has helped to address the issue of poor interaction between curriculum designers, instructors and industry in designing a sound curriculum to develop technical communication. In addition, in the pilot study, the proposed survey instrument (developed based on FDM findings) has been analyzed using EFA in understanding its factor structures and psychometric properties (Osborne, 2014). This has contributed in term of proposing an instrument that not only reflects the theory but also has construct validity and reliability. In addition, through the use of SEM analysis, the unobserved variables and its relationship have been tested in proposing the model. Ramayah et al. (2018) support that this analysis is suitable in predicting and explore contributions of each component in the model. As the result the proposed model has also achieved its reliability and validity. Thus, the current study has addressed and contributed to instruments and model development for technical communication skills development.

Thirdly, in term of implication for teaching practices, the findings of the current study are relevant to base the curriculum and module development for effective implementation in Malaysian Vocational Colleges. In this study, the foundation of this model has considered the relevant theories (technical communication, general communication, curriculum development and industry-based curriculum theory) and opinions of selected experts for the model development. Even though the findings are specifically for Malaysian Vocational Colleges, we can use these findings for other TVET institutions both in Malaysia and globally. For instance, the proposed objectives, content of learning, methods of delivery and assessment methods reflect Wellington's (1993) description of industry-based curriculum and technical communication frameworks. Hence, emphasize should be given on providing students with authentic communicative experiences and encouraging students to research, collaborate and develop content of communication strategically. However, this does not mean that the proposed model can be simply applied in other context of TVET institutions. Marsh and Willis (2007) state that a sound curriculum must consider the social environment, and nature of learners, knowledge and learning needs. In addition, the importance of ELP in this model provides an additional value to technical communication development. Unsurprisingly, in the concept of ESP, ELP is viewed as 'variable characteristic' (Strevens, 1988), which explains ELP should be embedded in learning activities to develop technical communication skills. Hence, in future, it is important to consider to develop ELP skills along with the proposed content of learning as suggested in this study.

Recommendations for Future Study

Even though the current study has proposed technical communication pedagogical model for an industry-based curriculum in Malaysian Vocational Colleges, there are a number of important recommendations for future study. It is suggested that future researchers to further investigate the problem with current practices of teaching delivery among English language instructors in Malaysian Vocational Colleges. It is found that the experts agreed that ICT-based and collaborative activities as important means to deliver technical communication, but the English language instructors have an opposite opinion on this matter. Therefore, further investigation on this matter will provide more insightful information to understand this problem.

It is also important for the next researchers to expand the current study in different TVET institutions in Malaysia. Since Malaysian TVET is offered at different levels in different institutions, such as polytechnics, junior vocational colleges and Malaysian technical universities, it is important to expand the current model in these institutions.

Furthermore, it is suggested that the next researchers to develop technical communication module based on the proposed model. In doing so, a design and development research (DDR) as proposed by Richey and Klein (2007), can be considered as the research design in developing this module. Once it is developed, evaluation on its effectiveness module should be conducted in order to confirm its relevancy for TVET institutions in Malaysia.

In addition, in term of methodology, it is suggested that the future researchers to maximize the sampling for SEM analysis. In this study, 100 English language instructors were selected for pilot study and EFA analysis, and another 205 for actual study. The overall population is 435 instructors. Therefore, it is suggested to maximize the number of participants as the current sampling is less appropriate for CB-SEM with AMOS (Kline, 2010) as the analysis requires bigger sampling to achieve a stable estimation of covariance and good fit of the model.

Conclusion

Communication is one of the important skills for employment. The current body of literature has showed that the importance of communication skills in securing jobs for our graduates (Mourshed, et al., 2014; Nagendra et. al, 2013; Oxtoby, 1997; Tabbron & Yang, 1997). However, having a very general communication teaching and learning in TVET institutions is inadequate. The current industry is exploring the potential of technical communication skills, which is very specific and strategic communication strategy that helps in delivering effective communication in real industry settings (Brinkman & van der Geest, 2003; Reaves, 2004; Rus, 2014). However, in general TVET institutions still struggling to equip technical communication skills among graduates. As the result, a number of studies have reported the unemployment of

TVET graduates is rising over the year (Mourshed et al., 2014; Nagendra et al., 2013; Oxtoby, 1997; Tabbron & Yang, 1997). The mismatch between the outcomes of TVET institutions and industry needs is among the prominent reasons to this situation. In the context of Malaysia, Ibrahim, et al. (2012) found that there is a mismatch between TVET outcomes and industry needs. The industry required more proficient workers, which includes communication skills. However, our TVET institutions slightly failed to realize this.

Even though a number of institutions have started to introduce technical communication, there is still a problem in providing a clear direction and guideline for curriculum development and implementation (Nagendra et al. (2013). Therefore, based on the belief that technical communication is highly potential to help equip students with relevant work-based communication skills, the current study has outlined three major objectives: a) to identify key determinants of an industry-based technical communication skills pedagogical model for Malaysian Vocational Colleges from industry and TVET experts' perspectives, b) to propose an industry-based technical communication skills pedagogical model for Malaysian Vocational Colleges, and c) to evaluate the effect of English language proficiency on the development of industry-based technical communication skills pedagogical model for Malaysian Vocational Colleges.

The process begins with needs analysis phase. First, an extensive review of literature was conducted and followed by fuzzy delphi method. 17 experts from industry and TVET institutions were selected. With the review of literature on all components for this industry-based technical communication skills pedagogical model and fuzzy delphi method, the experts have come to a conclusion on pertinent elements for each curriculum component. Later an instrument for data collection in Malaysian

Vocational Colleges was designed and piloted on 100 English language instructors. An EFA was conducted to explore the dimensions of each construct, since the instrument is an adapted and developed based on literature and experts' opinion (Osborne, 2014; Williams et al., 2010). Later, the modified survey questionnaires were administered on 205 English language instructors across Malaysia. The data was analyzed using SmartPLS (PLS-SEM) as it is more appropriate for initial stage of theoretical development, which also allows researchers to test and validate the proposed model (Henseler et al., 2009).

The findings of this study are very interesting. First, all components (objective, content of learning and assessment) have a significant relationship to the perceived importance of technical communication pedagogical model, except for method of delivery. The proposed components of this model are presented in Table 7.1. In implementing this model in Malaysian Vocational Colleges, it is advisable to consider the findings of the current study.

Table 7.1

The proposed components for Technical Communication Pedagogical model.

	Objective
1.	Develop oral communication skills that are relevant to the industry.
2.	Develop written communication skills that are relevant to the industry.
3.	Develop interpersonal skills that are relevant to the industry.
4.	Develop researching skills that are relevant to the industry.
5.	Provide work-related communicative experiences for students.
6.	Guide teaching and learning for communication skills in technical field.
7.	Expose students with authentic communicative experiences in the real settings of the industry.
	Content of learning: Oral Presentation
1.	Develop the ability to retrieve relevant information.
2.	Develop the ability to gather and organize relevant information.
3.	Develop the ability to distinguish main ideas from supporting details.
4.	Develop the knowledge on how to operate technological tools.
5.	Develop awareness of how technological tools help to promote social-interactions and collaboration at work.
6.	Develop the ability to plan and develop the content of oral presentations.
7.	Develop the ability to plan and prepare visual aids (for larger audience).
8.	Develop the ability to plan an introduction and conclusion of oral presentations.
	Content of learning: Social Literacy
1.	Develop the ability to communicate effectively with co-workers and administrators.
2.	Develop the ability to effectively give instructions.
3.	Develop the ability to give constructive feedbacks.
4.	Develop the ability to establish professional relationships with customers and co-workers.
5.	Develop the ability to share information in small group settings.
6.	Develop the multicultural awareness.
7.	Develop the ability to positively handle conflicts within groups.
8.	Develop the leadership skills.
9.	Develop the ability to produce business letters.

	Method of Delivery (insignificant)
1.	Delivering the content through practical tutorial.
2.	Delivering the content through collaborative learning activity.
3.	Delivering the content through field training.
4.	Delivering the content through communication module which introduces technical communication across technical subjects.
5.	Delivering the content through communication across curriculum (integrates technical communication skills across technical subjects).
6.	Delivering the content through contextualized learning activity (which is conducted in an authentic working environment).
	Assessment Method
1.	Assessment on students' oral presentations.
2.	Assessment on students' written technical documents.
3.	Observation on students' communicative experiences during field work training.
4.	Observation on students' communicative experiences in group activities / team work projects.
5.	Assessment on students' responses in online forum discussion.
	English Language Proficiency
1.	Developing the ability to construct accurate sentence structure in writing.
2.	Developing the ability to apply appropriate verbal communication strategy in a conversation.
3.	Developing the ability comprehend information in a text in English language.

Firstly, the objective of the learning process should be focusing on developing social literacy and oral presentation skills. The objectives should also consider the importance of authentic communicative experiences and providing a clear guideline for English language instructors to implement technical communication in the context of Malaysian Vocational Colleges. These findings reflect the concept of technical communication and pedagogical model in general.

Secondly, the content of learning should highlight the development of social literacy and oral presentation skills. In real industry settings, students are expected to apply social literacy skills (which also refer to interpersonal skills) by effectively communicate and establish relationship with customer and co-workers, give instruction and constructive feedbacks, and to express awareness multicultural in working environment (Brinkman & van der Geest, 2003; Cook, 2002; Laverty, 1979; McMurrey, 2002; Nutman, 1987). Also, the development of oral presentation skills are pivotal to be emphasized in the implementation of technical communication pedagogical model. Skills such as retrieving, gathering and organizing information, distinguishing main ideas in a text and showing awareness of how technological tools help to promote interactions, planning introduction and conclusion, as well as planning relevant content are the reflection of both oral technical and researching skills (Brinkman & van der Geest, 2003; Cook, 2002; Laverty, 1979; McMurrey, 2002; Nutman, 1987).

Thirdly, even though method of delivery has no significant relationship to relationship to the perceived importance of technical communication pedagogical model, there is something that we can learn from this. In the current practice of teaching in Malaysian TVET institutions. especially among English language instructors, the issue of overbearing workloads has been discussed in a number of literature (Abdullah & Majid, 2013; Abdul-Wahab,. Zakaria & Jasmi, 2010; Alazam et al., 2012; Mahmud & Ismail, 2010). As the result, the instructors might prefer the traditional way of teaching instead of the use of ICT and collaborative learning activities. Thus, a considerable amount of attention should be given on this matter.

Fourthly, the proposed assessment methods in the current study are in line with the aspiration of improving the delivery of Malaysian TVET institutions. In the 10th Malaysia Plan, the Economic Planning Unit (2010) mentioned that collaborative learning and ICT are among teaching and learning activities that should be conducted and used widely. Similarly, the findings of the current study noted that the proposed assessment methods are in parallel to this suggestion such as oral presentation, writing technical documents, as well as observation on students' communication during group work, field training and online forum. Terminology examination was rejected in this study. This is in line with suggestion to improvise assessment in TVET institutions highlighted by Rahman et al. (2014).

It is also important to note that, in this study, the perceived importance of English language proficiency (which focuses on the ability to use accurate sentence structure, apply appropriate verbal communication strategy and comprehend information) plays as complement partial mediation in relationship between perceived importance of technical communication pedagogical model with content of learning and assessment method. Therefore, in implementing the content of learning and assessment to develop technical communication, attention must be given on students' ability to use accurate sentence structure, apply appropriate verbal communication strategy and comprehend information.

Lastly, to measure the endogenous variable (perceived importance of technical communication), two latent variables and relevant item were used (Learning Environment and Teacher Competency variable). In the pedagogical model development. Glaser (1962) and Hallam and Ireson (1999) emphasized on the importance of teaching competency and effective learning environment as precursors to effective pedagogical design. Borrowing these lenses, the current study employed both components in representing technical communication pedagogical model. The findings of predictive relevance indicated that the overall model has predictive relevance and thus, is relevant to be used a reference point to be implemented in Malaysian Vocational Colleges.

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