



Framework for Technical Communication Skills Content Development for Students in Malaysian Vocational Colleges: A Fuzzy Delphi Study

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Abstract: Developing technical communication is vital to ensure employability of graduates in Technical and Vocational Education and Training (TVET) institutions. However, limited studies are available to guide its development in Malaysian Vocational Colleges. Hence, this study is aimed at proposing a framework for technical communication development for effective implementation in Malaysian Vocational Colleges. This study employs Fuzzy Delphi Method (FDM) with 17 experts from industry and TVET institutions in identifying the prominent content of learning for technical communication skills development of students in Malaysian Vocational Colleges. Generally, the findings suggest that all clusters of technical communication skills (oral technical, written technical, interpersonal and researching skills) are important to be emphasised as the content of learning, with a high percentage of agreement (>75%). However, a number of items under Content of Learning components were omitted. For instance, two items under Oral Technical Communication, eight items under Written Technical Communication, two items under Interpersonal and one item under Researching Skills achieved percentage of agreement below 75%. The proposed framework is a relevant reference in introducing technical communication in Malaysian Vocational Colleges.

Keywords: TVET, technical communication, Fuzzy Delphi Method (FDM)

1. Introduction

The teaching and learning in Technical and Vocational Education and Training (TVET) institutions are based on the concept of industry-based education. Jessup (1968) describes the aim of an industry-based education is to develop students' 'mental' and 'manual' element, which in turn will enhance their employability. 'Mental' element refers to foundation knowledge and 'manual' element refers to application of job-specific skills. UNESCO (2015) further defines TVET as an education platform that promotes academic foundation along with training and skills development for the work field. However, identification and preparation of curriculum for TVET is quite a challenge. Tabbron and Yang (1997) and Male, Bush and Chapman (2011) argued that developing specific 'mental' and 'manual' elements for a particular job is not easy as the advancement of technology has demanded graduates to acquire more flexible skills. That is the reason why UNESCO (2015) recently highlights the importance of transversal skills for employment.

Fundamental to employability skills development of TVET graduates, Wellington (1993) provides a broader description of an industry-based education by highlighting the importance of developing employability skills on top of technical skills. In his work, he reviewed the Secretary's Commission on Achieving Necessary Skills (SCANS) (1991), study and categorized these skills into two clusters: a) foundation skills and b) working competencies. Foundation skills cover basic skills (reading, writing, listening, speaking and arithmetic skills), thinking skills and personal qualities (responsibility, sociability, integrity, self-management and self-esteem). Working competencies include resource, interpersonal, information, system and technology skills. These skills are transferrable across various disciplines of works and thus are very important to be developed in TVET institution.

In addressing this issue, an introduction of technical communication skills is pivotal. Technical communication is a strategic communication that exclusively considers purpose, content and context of communication to effectively deliver information in working field (Cook, 2002; Lappalainen, 2010; Rus, 2014). These skills can be categorized into four: a) oral technical, b) written technical, c) interpersonal and d) researching skills (Brinkman & van der Geest, 2003; Cook, 2002; Lappalainen, 2010; McMurrey, 2002; Reaves, 2005; Rus, 2014). Findings of previous studies have appointed its importance in preparing students for real communication in industry (Lappalainen, 2010; Reaves, 2004; Rus, 2014).

However, there is still a problem in the current practice of developing these skills in TVET institutions. Despite the importance of these skills for employment, Reaves (2004) notes that there is still a mismatch between expected outcomes of technical communication courses and students' communicative abilities. Possibly, a poor interaction between industry and curriculum developers has led to this situation. This resonates Nagendra et al. (2013) concern, as they expressed that there is poor direction for curriculum design and assessment in enhancing the mastery of these skills in TVET institutions. Very differently, in the recent report in UNESCO TVET strategy 2016-2021, UNESCO-UNEVOC (2016) states that collaboration with various parties, especially employers from relevant industry is vital for TVET curriculum development and implementation in enhancing students' employability skills. Therefore, there is a need to further explore the local industry needs for communication-for-work skills and develop a sound curriculum in introducing and developing these skills in TVET institutions.

2. The Current Study

Realising the importance of developing technical communication skills that are in line with the communicative practices of the current industry, there is a need to carefully identify relevant subskills of technical communication practiced in local industry in Malaysia. As one of the important TVET delivery platforms, Malaysian Vocational Colleges plays a pivotal role to provide early development of this skill. However, what is worrying, when reviewing the current curriculum of academic components (specifically English subjects), a very limited exposure is given on technical communication development. MOEM (2014) highlights that the offered subjects are aimed to develop basic communication and proficiency in English. Therefore, in overcoming this problem, a framework for technical communication skills content development for students in this institution is highly needed. Relevant information from TVET and industry experts are therefore needed in designing a sound content for technical communication curriculum in Malaysian Vocational Colleges. Hence, this research is aimed at answering this main question: What is the prominent content of learning for technical communication skills development of students in Malaysian Vocational Colleges?

3. Methodology

The current study employs Fuzzy Delphi Method (FDM), which is a relevant method to gather experts' opinions and reach a consensus on important suggestions for a specific area of study (Kaufman & Gupta, 1988; Siraj, Alias, DeWitt & Hussin, 2013). Before conducting FDM, an extensive review of literature on relevant content for technical communication curriculum for Malaysian Vocational Colleges was conducted. Through FDM, the suggested content was evaluated and rated by the selected experts. This design is relevant to the framework development as Ellis and Levy (2010) note that the involvement of panel expert with critical review of literature will help to produce a solid outcome for module or model development.

3.1 Sampling

A minimum of ten experts is required in FDM to help achieve a higher consistency level in their opinion (Adler & Ziglio, 1996). In this study, 17 experts were identified from industry and TVET institutions using purposive sampling technique. This sampling technique was utilized as it helps to yield relevant outcomes expected for this study (Chua, 2010). The criteria in selecting the experts are presented in Table 1.

Table 1 - Experts criteria for FDM

TVET experts	Industry experts
have master or doctoral degree in the respective field of TVET	have at least diploma or equivalent certification (such as Malaysian Skills Certificate Level 4)
have five years or more teaching experiences in any TVET field	have more than five years of working experiences in industry
have experience in fieldwork training in TVET institutions	have experiences in training and monitoring TVET students during industrial training

3.2 FDM Instrument

A FDM instrument with five-point Likert scale has been developed based on an extensive review of literature on technical communication skills development. Based on the previous studies (such as by Brinkman & van der Geest 2003; Cook, 2002; Lappalainen 2010; McMurrey, 2002; Reaves, 2005; Rus, 2014), the skills of technical communication can be categorized into four domains: a) oral technical communication skills, b) written technical communication skills, c) interpersonal and d) researching skills. These sub-skills for each domain were identified and used in developing the instrument. The initial instrument was presented to seven experts from the panel. These experts were asked to give feedbacks for improvement. Once this process was completed, modifications were made. The final FDM instrument has an overall of 41 items from two sections: Section (Demographic Information) and Section B, with four domains (oral technical communication skills, written technical communication skills, interpersonal and researching skills). Table 2 provides a summary of number of items in this instrument.

Table 2 - Summary of FDM instrument

Section	Domain	No. of items
A	Demographic	5
B1	Oral Technical Communication Skills	10
B2	Written Technical Communication Skills	10
B3	Interpersonal Skills	10
B4	Researching Skills	7
	Total	42

3.3 Data Analysis

For data analysis, the experts' responses of the FDM instrument were carefully analysed using the steps suggested by Siraj et al. (2013). Fig. 1 illustrates the overall process of the data analysis.

Firstly, the responses were converted from linguistic variables to fuzzy scale. This is followed by calculation of average distance between two fuzzy numbers and group consensus. The spacing value of these fuzzy numbers should be smaller than 0.2 and consensus percentage should be 75% and above (Siraj et al., 2013) in order for an item to be accepted. Next, defuzzification was conducted to convert these values to crisp real number, in ranking its importance.

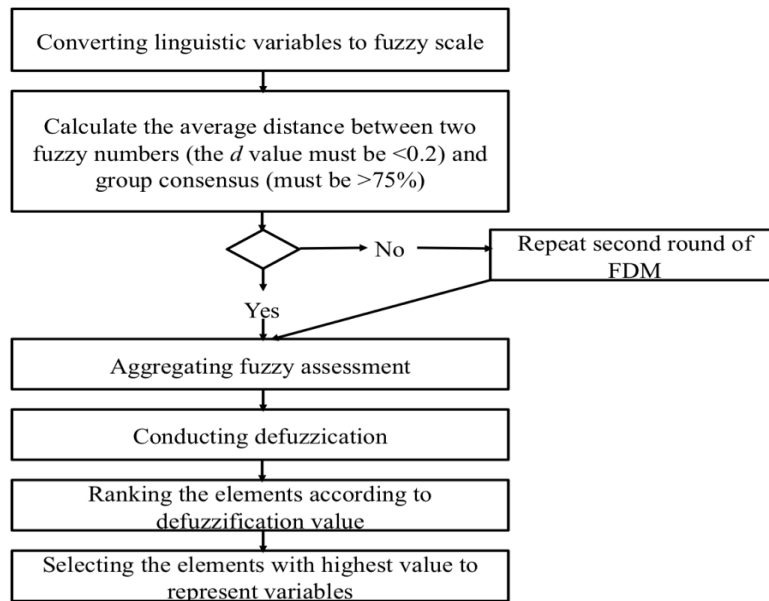


Fig. 1 - FDM analysis process.

4. Findings

4.1 Demographic of Respondents

The demographic of panel of experts is presented in Table 3 below. Most of the panels are academic and non-academic experts, who have a degree in respective field and less than ten years of working experience. The TVET experts are from a number of TVET institutions and one of them is specialized in Teaching English as a Second Language (TESL). On the other hand, the industry experts are from various fields such as healthcare, manufacturing, business management, electrical engineering, architecture, building construction and hospitality.

Table 3 – Demographic of respondents

Education Level		Area of Expertise	
Level	Frequency	Area	Frequency
Diploma / Malaysian Skills Certificate Level 4	2	TVET	6
Degree	7	TESL in TVET institution	1
Master's Degree	2	Healthcare	1
Doctoral Degree	6	Manufacturing	1
Total	17	Business Management	1
Working Experience		Electrical	1
Years	Frequency	Architecture	1
Less than 10 years	6	Building Construction	1
11 – 20 years	4	Hospitality (Tourism, Hotel Management, and Culinary)	3
21 – 30 years	3	Total	17
31 years and above	4		
Total	17		
Employment Status			
Status	Frequency		
Academic Professional	7		
Non-Academic Professional	7		
Technical	3		
Total	17		

4.2 Oral Technical Communication Skills

For oral technical communication skills, eight out of ten suggested were accepted. The percentage of consensus for each proposed item is presented in Table 4.

Table 4 – Summary of experts’ consensus values for oral technical communication skills items.

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

Based on this result, the panel 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.

However, the panel rejected that:

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%).

4.3 Written Technical Communication Skills

For written technical communication skills, only two out of ten suggested were accepted. The percentage of consensus for each proposed item is presented in Table 5.

Based on this result, the panel 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.

However, the panel rejected that:

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%).

Table 5 – Summary of experts' consensus values for written technical communication skills items.

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

4.4 Interpersonal Skills

For interpersonal skills, eight out of ten suggested were accepted. The percentage of consensus for each proposed item is presented in Table 6.

Table 6 – Summary of experts' consensus values for interpersonal skills items.

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

Based on this result, the panel 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.

However, the panel rejected that:

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%).

4.5 Researching Skills

For researching skills, six out of seven suggested were accepted. The percentage of consensus for each proposed item is presented in Table 7.

Table 7 – Summary of experts’ consensus values for researching skills items.

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

Based on this result, the panel 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.

However, the panel rejected Item 7 which is ‘The ability to research how users utilize technologies is important to be emphasized in the content of learning’ (achieving consensus value of 41%).

5. Discussion

Based on an extensive review of literature, it is relevant to state that technical communication consists of oral technical, written technical, interpersonal and researching skills (Brinkman & van der Geest, 2003; Heylen & Sloten, 2013; Keane & Gibson, 1997; Male, Bush & Chapman, 2011). For oral technical communication skills, the experts only agreed on seven sub skills, which include the ability to: a) deliver speech, b) plan and prepare visual aids, c) plan introduction, content and conclusion of a presentation, d) define communication purposes and audience, e) find appropriate situation for oral presentation, and f) chair a meeting. In Malaysian Vocational Colleges, Ministry of Education Malaysia (MOEM) (2014) highlights that the current curriculum of English subject is to only develop basic communication skills. The findings of the current study have broadened and provided more refined oral communication skills that are valued by the local industry. In earlier work of Mitchell (1962), he described that technical communication should have clear purposes and organized strategy to effectively deliver the information. McMurrey (2002) and Rus (2014) further supported that an effective worker should be able to define and develop relevant content of oral communication to suit its professional purposes.

Secondly, for written technical communication, the findings suggested that only the ability to produce business letters and technical journalism were accepted. Unsurprisingly, in the context of Malaysian Vocation Colleges, MOEM (2014) mentioned that the graduates are only expected to acquire basic note-taking, summarizing and basic technical documents skills before working in the industry. However, the ability to produce technical journalism is beneficial if the students are interested to further their study in tertiary education. McMurrey (2002) and Lappalainen (2010) similarly emphasised the importance of developing this skill as the current global industry requires workers to address issues in technical field using a research-based approach and writing. In the context of TVET, they suggested institutions to expose students to this skill by developing students' information searching, information organizing and reporting skills.

Thirdly, for interpersonal skills, the experts agreed that Malaysian Vocational Colleges should help to develop students' ability to effectively: a) communicate with co-workers and administrators, b) establish professional relationships, c) handle conflicts, d) practice leadership skills and multicultural awareness, e) give instructions and feedbacks, and f) share information in small group settings. Lappalainen (2010) found that interpersonal skills are among important elements for communication in real industry settings. Similarly, Brinkman and van der Geest (2003) and Cook (2002) emphasised the importance of developing interpersonal skills in ensuring students are able to effectively communicate and utilize technology in communicating information for work.

Lastly, for researching skills, the experts agreed that students in Malaysian Vocational Colleges should be able to: a) retrieve, gather and organize information, b) distinguish main ideas from supporting details, c) comprehend work-related journals and technical material, and d) awareness and knowledge how to operate technological tools to enhance communication. Brinkman and van der Geest (2003) mentioned that in technical field, workers are expected to be able to have information searching skills, build logical argument and design documents to suit the purpose of communication and its target audience. In this study, the experts agreed on this matter as well the suggestions proposed by Cook (2002). The ability to utilize technological tools to enhance information researching as well as multicultural awareness are very important because the workers are expected to deal with various customers from different cultural settings.

6. Conclusion

The current lacuna of literature emphasizes on the importance of communication skills in ensuring graduates' employability (Mourshed, et al., 2014; Nagendra et al., 2013; Oxtoby, 1997; Tabbron & Yang, 1997). However, less emphasised is given to develop communication for work skills in our TVET institutions. Therefore, the current study has proposed a framework for technical communication development for effective implementation in Malaysian Vocational Colleges. In real industry, the graduates are expected to apply all four clusters of skills (Brinkman & van der Geest, 2003; Cook, 2002; Laverty, 1979; McMurrey, 2002; Nutman, 1987). The findings of this study are line with this. The experts agreed that all four clusters of skills (oral technical, written technical, interpersonal and researching skills) are pivotal to be emphasised as the content of learning in Malaysian Vocational Colleges. Therefore, in implementing the content of learning in Malaysian Vocational Colleges, attention must be given on developing these four clusters of technical communication skills.

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