# Exploring the Needs of Technical Writing Competency in English among Polytechnic Engineering Students

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**Abstract**
Industries demand fresh graduate to possess technical writing skills in order to be employed. Thus, technical writing competency in engineering organization cannot be underestimated. In consequence, this study attempts to explore technical writing competency needs perceived by Malaysian polytechnic engineering students in terms of knowledge, skills, and attitudes towards technical writing in English. 207 diploma students among various engineering courses of a polytechnic have responded to a survey on students' perceived technical writing competency needs. Results of the study indicated that the students showed low moderate agreement (mean score <3.5) in their knowledge, skills and attitudes towards technical writing in English. Skills in technical writing in English revealed the lowest mean score compared to knowledge and attitudes towards technical writing in English. This implied that the students were lack in technical writing skills in English. Despite, the study has shown that students were aware of the need in technical writing competency for their future career. Therefore, this study has pointed out that it is worth to review the current needs of the polytechnic engineering students since students' responses could become a basis for the refinement of the material used in the classroom since need analysis is a continuous process in identifying learning needs. Finally, this study has proposed technical writing course to be introduced to the polytechnic education system since the competency in technical writing is essential in job industries including within engineering professions.
**Keywords***:* Technical Writing Competency, Writing In English, Need Analysis, Engineering Students, Polytechnic

## Introduction

Past literatures have pointed out that technical writing can be defined as a communication activity in dealing and delivering technical information and subjects such as in technology, engineering, science and other fields with specific terminologies at certain workplaces through writing (Finklestein, 2007; Indra Devi, Husin & Subatira, 2010; Laplante, 2012; Manivannan, 2005; Pfeiffer & Adkins, 2010; Van Endam, 2005). This shows that technical writing is an important skill to almost any profession including engineers, scientist, architects, physicians, lab technicians and so forth. In fact, job industries demanded potential employees with sound technical communication skills including technical writing (Kassim & Ali, 2010; Rhoulac & Crenchaw, 2006). More than that, employees in industry spent their time mostly in technical

writing. For example, working time from numerous job functions in industries is spent almost on writing at the workplace such as technical writing (Mohd Raus, 2005; Nordin, 2013). By having technical writing competency, one could convey crucial information clearly and accurately to target audience with specific purpose (Laplante, 2012; Van Endam, 2005).

The term competency is a tool that one can use with the purpose to demonstrate a high standard of performance. The definitions of competency were found in various perspective in the literature. McClelland (1973) proposed competency as a term which was different from the traditional norms of assessment in the context of higher education system with less emphasized on evaluation of intelligence. However, more specifically, competencies were connected with knowledge and skills in carrying out certain tasks or projects successfully (Quinn, Faerman, Thompson & McGrath, 1990). Spencer and Spencer (1993) defined competency as "an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job situation" (p.9). According to Hoffman (1999), competency can be defined in three points, which are: (1) underlying personalities and qualification, (2) noticeable behaviours; and, (3) benchmark of performance outcomes for individual. However, Parry's definition of competencies has been accepted by numerous scholars which indicated that a combination of knowledge, skills, and attitudes which concern with the performance of one's job, can be measured and improved by practice and enhancement is so-called a competency (Lucia & Lepsinger, 1999).

Competence in writing in English could be an added value to any future employees when seeking a job since English language has become an important and global medium of communication widely. In fact, by possessing good technical writing skills will allow students to be competent in communication skills and may give them a credit when applying job (Laplante, 2010; Tebeaux, 1983). A study on developing a new skills standard to produce knowledge worker in Malaysia had identified that workers are required to bolster their competency which helps them to carry out their job well (Ismail, Mustapha, Spottl, & Md Yunos, 2013). Since English is a global language, workers need to be competent with the world language to broaden their knowledge. Furthermore, employers seek candidates who not only have excellent academic performance but also possess good communication skills in both spoken and written English (Ngah, Mohd Radzuan, Fauzi, & Zainal Abidin, 2011; Nordin, 2013; Raftopoulas, Coetzee, & Visser, 2009; Raybould & Sheedy, 2005). Thus, the keys to success within the engineering profession is the ability to communicate in both spoken and written English (Bonk, Imhoff, & Cheng, 2002). Additionally, writing skills in English was found to be very much important as speaking and listening skills for entry level employment (Zubairi, Sarudin, Nordin, & Tunku Ahmad, 2011).Therefore, technical communication in English entails a robust foundation in general writing, including knowledge in grammar, writing mechanics and punctuation conventions (Gerrish et al., 2007). In other words that means, students should be taught technical writing at an early age to develop the foundation of technical writing in English (Herzogs & Hinds, 2015). Consequently, students who are unable to write well in English are at

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a significant hindrance. Hence, technical writing competency in English has become a credit to possess to any fresh graduate in job industries (Kassim & Ali, 2010; Rhoulac & Crenchaw, 2006). The potentials of failure for instance, negative attitudes towards writing activity or assignment in English language may create negative feelings on writing. This negative element may affect students' performance to their studies. For instance, a study was conducted at one technical institution in Malaysia among engineering students found that most were often disappoint to show basic grammar, expected vocabulary, error-free sentence structures when writing technical reports in English with appropriate manner (Indra Devi et al., 2010). In another study at other technical institution in Malaysia on engineering students' perceptions towards writing in English indicated that there were three categories of students perceptions: (1) students who enjoy and are confident to write, (2) students who is moderately enjoy in writing and lacking confidence and (3) students who dislike writing due to negative feelings, attitudes towards writing and lacking knowledge and proficiency in English language mostly in vocabulary and grammar usage (Idrus, 2008).

In designing English language courses, needs analysis should be considered as the main elements especially in the field of English for specific purposes for example English for engineering programme (Dudley-Evans & St. John, 1998; Hutchinson & Waters, 1992). Need analysis studies are divided into three major landmarks which are Learning Situation Analysis, Present-Situation Analysis and Target-Situation Analysis. According to Dudley-Evans and St. John (1998), Learning Situation Analysis consists of process-oriented needs, felt and subjective. Meanwhile, Present-Situation Analysis includes strengths and weaknesses in language, skills and learning experiences. Lastly Target Situation Analysis comprises learners' necessities, lacks and wants. This study adapted the Present-Situation Analysis approach since it is more suitable for the objectives of the study which are to determine students' technical writing competency in English in terms of knowledge, skills and attitudes, to identify their experience in learning writing a project report in English classroom and to investigate their needs of technical writing competency in English.

A study on needs analysis was carried out by Al-Tamimi and Shuib (2009) to explore the English Language needs of 81 petroleum engineering students at Hadhramout University of Sciences and Technology, Yemen. The findings stated all the language skills namely, listening, reading, and writing sub-skills are almost to be important to obtain. Besides, most of the students felt that they are unable to use English efficiently. The findings also revealed that the students found the English language course does not meet their language needs and the time allocated for the course is insufficient to practise English language efficiently. In fact, the students preferred to learn courses which relevant to English for Work-related Purpose. In other words, the students are more likely to learn English for workplace such as technical writing course. In similar case, a study on English language needs on 225 students of various engineering field was conducted at one of the largest schools of engineering in Iran, Sharif University of Technology found that technical writing has been completely overlooked in the English curriculum yet was considered to be significant to the engineering students (Mohamed Salehi, 2010).

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The alertness of the urgency of technical writing competency has happened in Malaysia since 2003. Board of Engineers Malaysia (BEM, 2003) has identified communication skills development (CSD) as one of the ten learning outcomes in the competency manual being used and it draws information for any engineering programmes to be recognized. The main objective of recognition is to make sure that the recognized engineering programmes carried out by the institutes of higher learning in Malaysia satisfy the least academic necessities for registration as a graduate engineer with the Board of Engineers Malaysia (BEM). Therefore, all graduate engineers and technical personnel must be able to communicate effectively, not only among themselves but also with other people likely to be encountered throughout a developing career. From the initial stages, careful attention must be given to the skills of clear, concise reporting - both oral and written - at the level of demand or comprehension of the recipient (BEM, 2003). With this in concern, the curriculum at higher learning education institutions have included courses that will provides its graduates with the ability to effectively communicate both in verbal and written in English, which generally is called as technical writing course.

According to the Department of Polytechnic Education (2009), the English language courses offered in the diploma of engineering programmes at Malaysian polytechnic aims to prepare students with required skills in academics and in technical context with the purpose of preparing the students for working in industries. However, it is found that technical writing in English is not fully implemented and the assessment of written task does not contribute much in the marking scheme of the English for communication course (Department of Polytechnic Education, 2011). Thereby, students may not see written communication in English as important as other skills. This might create a negative perception towards writing in English. As stated by Warnock and Kahn (2007), many engineering students see writing as unrelated to their future career goals. The current Communicative English courses at polytechnic are taught across all disciplines whereby students of different fields such as engineering, accounting, marketing, and others take the same English course. Therefore, the syllabus of current English courses may not be able to completely provide the students' particular language needs as for example technical writing course for engineering students (Sanmugam, 2013). In addition, a recent study by Lam and Chong (2013) have investigated polytechnic students' perceptions on their language learning experiences during their Communicative English course and revealed that more than half of the students agreed that the English language curriculum did not help them to improve their English. While, a study conducted by Md. Yasin et al. (2010) on English skill deficiencies of polytechnic students, found that understanding technical documents, using correct grammar, vocabulary and sentence structure, writing test/investigation report and questioning for clarification are among the important skills that polytechnic students lacked of. According to Mustapha et al. (2008), on a study which determined readiness among students on K-economy and globalization highlighted about incorporating communication and research skills in technical curriculum. Hence, knowledge in writing a technical research project which may improve written communication skills is in think to produce a competent worker. On the other hand, these are the skills that students should acquire as well as the skills needed by the

industries (Md Yasin et al., 2010). However, 31.5% of unemployed graduates in Malaysia were among graduates from polytechnic and lacking in written communication skills was one of the major reason that caused this problem (Esa, Selamat, Padli & Jamaluludin, 2014). In other studies earlier, due to lacking in communication skills for both spoken and written in English, numerous number of the graduates from Malaysian polytechnics are jobless (Md. Yasin et al., 2010). This might give negative reflect on the quality of polytechnic graduate. As stated by Idrus (2008), the inability of students to produce good quality of writing, might reflect to the quality of the graduates' students of the organization that they are belong to. Considering the above matters of polytechnic scenario, the present study tries to fill the gap of technical writing competency needs among engineering students at Malaysian polytechnic. Thus, this study aims to explore the technical writing competency needs of the engineering students at Malaysian polytechnic on the basis of students' perspectives. Specifically, the objectives of this study are to determine the engineering students' perceive on their technical writing competency in terms of knowledge, skills and attitudes towards technical writing in English and to investigate the student's perceived on technical writing competency needs.

**Methodology**

This study adopted the survey design approach, using questionnaires to gain data. The population of this study is 442 final year students from diploma of various engineering programmes at one polytechnic in Malaysia. The students are from three main departments namely, Civil Engineering Department (JKA), Electrical Engineering Department (JKE) and Mechanical Engineering (JKM). 46.8% of the population which are 207 students (60 students from JKA, 59 students from JKE and 88 students from JKM who volunteered to respond to the questionnaire. The selection of location was of logistic convenience and the respondents were selected using purposive sampling technique.

Prior to this study, a set of questionnaire was designed and piloted. The questionnaire was developed based on previous literature which mostly related to technical writing for engineering education (B. Nardo & Hufana, 2014; Gerrish et al., 2007; Sultana, 2014; Tatz et al., 2012; Van Emdan, 2005). The syllabi of Communicative English courses, English for Engineering and Technology course, Final Project courses of Malaysian polytechnic and Technical Writing course of one Malaysian technical university were referred in developing the questionnaire. In addition, the theory of communicative competence and the theory of competency also underpinned the development of the questionnaire. The questionnaire has been validated by five experts in language and communication field from higher educational institutions in Malaysia including content validation by the head of English language courses and the head of English language department from Malaysian polytechnics. The experts checked the questionnaire in terms of appropriateness of the format used, terms used, measurement scale, line spacing, language clarity, clear objective and instruction, comprehensible of each item, and whether the items were relevant to the construct of technical writing.

The questionnaire consisted of both open-ended and closed-ended questions which have two parts: (1) part A, and (2) part B. Part A elicits the respondents' profile. Part B, comprises three sections of 30 items of closed-ended type of statements on technical writing competency namely, knowledge in technical writing, skills in technical writing and attitudes towards technical writing. Items in part B were designed in a five-point Likert-scale ranging from "Strongly Disagree", "Disagree", "Moderately Agree", Agree", and "Strongly Agree" with values from 1-5 assigned to each alternative.

Reliability refers to the consistency of a measuring instrument. In the language testing literature, Cronbach alpha (α) is one of the most frequently reported reliability estimates (Brown, 2002). Cronbach alpha (α) value can range from 0 to 1 and developed to measure internal consistency of a test, scale or questionnaire. Internal consistency is referred to the extent to which all the items measure the same construct or concept (Cronbach, 1951). A pilot study was conducted prior before this study was embarked in order to ensure the reliability of the instrument. Results of pilot test revealed that Cronbach Alpha (α) values were as follow: 0.75 for knowledge in technical writing, 0.93 for skills in technical writing and 0.81 for attitudes towards technical writing. According to De Vellis (2012), Cronbach alpha (α) values > 0.7 are acceptable. Thus, the values of alpha (α) indicated that the instrument used in this study was reliable. A letter of permission to embark research at Malaysian polytechnic was gained from the Department of Malaysian Polytechnic, Ministry of Higher Education Malaysia prior to data collection. The questionnaires were distributed to the respondents personally by the researcher. All the data gained were loaded into SPSS (Statistical Package for Social Science) programme. The data were analysed using descriptive analysis to calculate the mean score and standard deviation values of students' perceived technical writing competency needs.

**Findings**

Table 1 summarizes students' perceived technical writing competency in terms of knowledge, skills and attitude from the perspectives of students which were mostly below mean scores 3.50. This countered to the first research objective of this study. The findings revealed that the students were low moderately agreed (mean scores < 3.5) on their competency in technical writing in English. However, skills in technical writing in English ranked the lowest overall mean score (3.43) compared to knowledge in technical writing (mean=3.46) and attitudes towards writing in English (mean=3.48).

**Table 1:** Overall Mean Scores for Students' Perceived Technical Writing Competency

| Technical writing competency | Overall Mean |
|---|---|
| Knowledge | 3.46 |
| Skills | 3.43 |
| Attitudes | 3.48 |

In particular, Table 2 below shows the mean scores of the students' perceived on skills in technical writing in English. Items 13, 23, and 24 under the section on skills in technical writing in English revealed the lowest mean score (mean=3.3) for the students' perspectives on their ability to construct concise objectives for a project, to write references for a project report using a correct way and ability to transfer information from written project report to oral report and vice versa. However, items 15, 16, and 18 on skills in technical writing revealed the highest mean score ( mean= 3.6) which indicated that the students were agreed that they were able to construct questionnaire items for a project, they were able to collect data using survey method (questionnaire) and they were able to collect research data using interview method. Meanwhile, the rest of the items such as ability to write project report using the correct format, ability to carry out a project which involves doing research, ability to construct interview questions and interpret information from graphs and charts revealed that the students were moderately agreed with mean score (mean=3.4).

**Table 2:** Mean Scores for Skills in Technical Writing

| Item | Statement | N | Mean | Std. Deviation |
|---|---|---|---|---|
| 11 | I am able to write a project report using the correct format. | 205 | 3.4 | .76 |
| 12 | I am able to carry out a project which involves doing research. | 203 | 3.4 | .74 |
| 13 | I am able to use various sources of information for a project report. | 204 | 3.4 | .72 |
| 14 | I am able to construct concise objectives for a project. | 203 | 3.3 | .75 |
| 15 | I am able to construct questionnaire items for a project. | 205 | 3.6 | .71 |
| 16 | I am able to collect research data using survey method (questionnaire). | 204 | 3.6 | .72 |
| 17 | I am able to construct interview question for a project. | 205 | 3.4 | .80 |
| 18 | I am able to collect research data using interview method. | 204 | 3.6 | .81 |
| 19 | I am able to construct graphs and charts that present data clearly and precisely. | 206 | 3.5 | .82 |
| 20 | I am able to analyse data of a research project accurately. | 206 | 3.4 | .72 |
| 21 | I am able to interpret information from graph and charts accurately. | 205 | 3.4 | .77 |
| 22 | I am able to construct conclusion from research findings in a project report. | 206 | 3.4 | .79 |
| 23 | I am able to write references for a project report using a correct way. | 205 | 3.3 | .73 |
| 24 | I am able to transfer information from written project report to oral report and vice versa. | 205 | 3.3 | .80 |

Table 3 displays the mean scores of the students' perceived specifically on knowledge in technical writing. The lowest mean score is 3.2 which indicated that the students were weak in writing technical documents with correct grammar (item 6). Apart from that, another item that

shows disagreement with the statement is item 5 with mean score 3.3. This revealed that the students were also weak in spotting error in technical written documents. Nevertheless, item 9 presents the highest mean score (mean= 3.7) which determined that the students perceived they are good in writing technical documents with correct punctuation.

**Table 3:** Mean Scores for Knowledge in Technical Writing in English

| Item | Statement | N | Mean | Std. Deviation |
|---|---|---|---|---|
| 1 | I know the differences between technical writing and other forms of writing. | 207 | 3.6 | .76 |
| 2 | I know different formats of written technical documents (eg: processes, procedures and instructions in user manual, project report and resume). | 207 | 3.5 | .75 |
| 3 | I know the meaning of specific terminology used in technical writing. | 205 | 3.4 | .79 |
| 4 | I know how to write using various technical writing style. | 206 | 3.4 | .76 |
| 5 | I know how to spot errors in a technical written document. | 207 | 3.3 | .82 |
| 6 | I know how to write technical documents with correct grammar. | 207 | 3.2 | .78 |
| 7 | I know how to write technical documents with correct spelling. | 207 | 3.4 | .79 |
| 8 | I know how to write technical documents with correct capitalization (capital and small letters). | 207 | 3.6 | .83 |
| 9 | I know how to write technical documents with correct punctuation. | 206 | 3.7 | .79 |
| 10 | I know how to distinguish between formal and informal English in technical writing. | 205 | 3.5 | .81 |

Results in Table 4 presents the mean scores of students' perceived their attitudes towards technical writing in English. Item 27 which investigated the awareness of the students on their weaknesses of writing technical document in English revealed the lowest mean score (mean= 3.24). This indicated that the students were not aware of their weakness when doing technical writing in English. According to the table, the students did not enjoy when completing technical writing tasks in English (item 25: mean=3.70). In addition, the students also did not appreciate when they were asked to compose technical writing tasks in English (item 26: mean=3.41). However, they were aware of the importance of technical writing in English for their future career and agreed in the importance of technical writing in English within the engineering profession (item 29:mean=3.69; item 30:mean=3.69). Furthermore, the finding also revealed that the students agreed that they need to improve their technical writing in English (item 28:

mean=3.5).Thus, the finding encountered the second research objective which is to investigate the student's perceived on technical writing competency needs.

**Discussions**

The findings in this study have shown that polytechnic engineering students were found low moderately agreed on their competency in technical writing in English. In particular, skills in technical writing in English ranked the lowest overall mean score compared to knowledge and attitudes in technical writing in English. Knowledge in technical writing in terms of knowledge in writing technical documents with correct grammar revealed the lowest mean score indicated that the students admitted that they are having difficulties in writing with correct grammar. This findings supported indirectly to the study conducted by Md. Yasin et al. (2010) on English skill deficiencies of polytechnic students on understanding technical documents, using correct grammar, vocabulary and sentence structure, writing test/investigation report and questioning for clarification. In addition, this findings also related to a study at another technical institution among engineering students which revealed that the engineering students' technical writing skill specifically in writing technical reports were often disappointing (Indra Devi et al., 2010). Thus, this study has shown that polytechnic engineering students having the same problem in technical writing with engineering students at other technical institution.

However, attitudes towards technical writing in English has shown the highest mean scores among the three technical writing competency focused in this study. For instance, awareness on the importance of technical writing in English and awareness on oral and written communication in English are important within the engineering profession shared the highest mean score. This indicated that polytechnic engineering students were agreed that technical writing in English is important. Furthermore, the findings in this study also showed that polytechnic engineering students want to improve their technical writing skill. Nevertheless, the findings of this study were found opposite to the statement by Warnock and Kahn (2007) which stated that many engineering students found writing are not related to their future profession.

**Conclusion**

This present study was conducted to explore technical writing competency in English needs perceived by engineering students at one polytechnic. As a whole, the findings revealed that, students' perceived technical writing competency in terms of skills in technical writing showed the lowest mean score. However, the students were positive that there is a need to improve technical writing competency and they were aware that technical writing competency is crucial for their future career within engineering professions. In conclusion, based on the finding of this study, polytechnic engineering students need to improve their competence on technical writing. This could be done by including more exercise on technical writing in English especially in the classroom activities. Apart from that, the material employed during teaching and learning session such as the module used in the classroom could be improvised by comprising more relevant input for engineering students. This could enhance engineering students' preferences in technical writing in English. Moreover, it is worth to review the current needs of the

polytechnic engineering students because responses from the students could become a basis for the refinement of the material used in the classroom which may be have been overlooked since need analysis is a continuous process in identifying learning needs. Consequently, technical writing course could be introduced in the polytechnic education system rather than placing it as a topic or sub-topic in the Communicative English course syllabus. This is because technical writing competency is crucial in engineering field. Thus, it is hope that further research on technical writing competency needs can be conducted to a wider population and at other Malaysian polytechnics since technical writing competency is imperative in engineering education.

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