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Communicative Competence Requirement in Technical Oral Presentation in Engineering Education: Stakeholder Perceptions in a Malaysian Context

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Abstract: The awareness that engineers operate and cooperate in interdisciplinary arenas necessitates the understanding of the significance of social skills required in the globalizing engineering communities where the members represent different educational backgrounds, cultures, and nationalities. In this light, engineers of the 21st century need to possess an adequate knowledge and understanding of stakeholders (members of the academic and professional engineering community) perception of effective communicative competence requirements in presentation skills and attributes required in Technical Oral Presentation (TOP). Technical oral presentations are a frequently practiced workplace communicative requirement. The Situated Learning Theory advocates that perceptions of selected stakeholders or participants in a Community of Practice (COP) reflect the participants' legitimate peripheral participation in a said discourse community. The study is based upon the final year engineering project (technical presentation) at a Malaysian university, which seeks to identify the presentation skills and attribute requirements as constructed by various selected stakeholders in TOP in engineering education. Both quantitative and qualitative findings are presented and described in the study. The study also discusses the pedagogical implications toward effective participation in the discourse community from an engineering education perspective.

Key words: Communicative competence, technical oral presentation, presentation skill, attributes

INTRODUCTION

The study outlines and discusses the findings of a research study conducted in a Malaysian university. The primary objective is to identify the perceptions on communicative competence among selected members of the academic and professional engineering community on technical oral presentation. Communicative competence has been used to describe the multi-faceted skills required for the effective use of language. The notion of communicative competence in presentation skills and attributes is investigated according to the use and participation by selected members of the academic discourse community (like students, engineering lecturers, research project supervisors and language teachers in engineering education) and professional engineering community (like professional engineers and industry practitioners). All respondents targeted in this study were directly or indirectly involved as examiners in the final year engineering project presentation or final year project 2, commonly referred to as FYP 2. The quantitative and qualitative key findings of the research are briefly presented and discussed in the study.

Rationale: Work place communication studies indicate that employer demands placed on engineers of the 21st century far differ from that of the 1990's as a result of globalization and industrialization in the new millennium (Nguyen, 1998; Patil, 2005; Radzuan *et al*., 2008; Schnell, 2006; Thomas, 2007). Studies indicate that engineers spent aut 58% of their time communicating in the workplace (Tenopir and King, 2004). The researchers interest in this study stems from the global concern over graduates lack of communicative competence in workplace communicative events as experienced in the Malaysian setting (Tan, 2008; Tay, 2008). The interest also stems from the continued academia-industry practitioner divide and the socio-cultural role of engineer's in engineering education and society today (Nguyen, 1998; Norback and Hardin, 2005; Shay, 2004, 2008). If graduate communicative competency is left unchecked, nation building plans will probably not materialize due to insufficient human capital.

Technical communication and presentation in engineering education: Technical communication, an offshoot of English for Specific Purpose (ESP) pedagogy, is communication aut scientific, engineering, technological, business, regulatory, legal, managerial, or social scientific information (DiSanza and Legge, 2003). A technical presentation, refers to a prepared formal presentation on scientific, engineering, technological,

business types, regulatory, legal, managerial, or social scientific information topics to non-expert audience (DiSanza and Legge, 2003). In the present study, the students' final year engineering project presentation is a form of technical oral presentation in technical communication.

The objective of the study is to elicit the stakeholder views and construct of effective communication skills and presenter attribute requirements in technical oral presentation. The feedback provides an insight of selected participants' views of communicative competence. It suggests and enhances second language learning (ESP materials) and lessens the existing academia-industry practitioner divide prevalent in oral communication studies (Norback and Hardin, 2005).

MATERIALS AND METHODS

The study was conducted at Universiti Teknologi PETRONAS (UTP), a private technical university located at Bandar Seri Iskandar, Perak Darul Ridzuan, Malaysia. Respondents were final year engineering students from the Mechanical Engineering (ME), Chemical Engineering (CHEM), Civil Engineering (CVE) and Electronics and Electrical Engineering (EE) program. The study took on a mixed method approach which obtained quantitative findings from a sample population of final year engineering students and qualitative inquiries from selected students, internal and external examiners involved in the project presentation.

A set of questionnaire was distributed to 240 randomly selected respondents. 83.3% of the questionnaires (200 respondents) were returned back to the researcher. Details are provides in Table 1.

A questionnaire comprising 65 items was adapted for the purpose of this study (Dyke, 2006; Miller *et al*., 1996; Morreale *et al*., 1993). Section A was on student demographics, section B on final year technical oral presentation while section C listed presenter skills and attribute items in a technical oral presentation. For section D, the items were on language and non-verbal skills in technical oral presentation. To obtain feedback for section C and D, a 5 point Likert scale ranging 1-5 (where 1 indicates strongly disagree to 5 for strongly agree) was utilized for frequency on presentation skills and attributes. To test the reliability of the scales used, Cronbach's Alpha was applied to estimate the internal consistency of the dimension to measure the reliability of the items (Hair *et al*., 1998; Malhotra, 2004). The alpha values of the said dimensions of the questionnaire are shown in Table 2.

Table 1: Respondents involved in the study

	Bachelor of engineering programme				
Students	ME	CHE	CVE	EE	Total
Gender					
Male	74	22	27	2	125
Female	8	40	26	1	75
Total	82	62	53	3	200

Table 2: Cronbach alpha values of each dimension

Dimension	Presenter skills and attributes	Language skills	Non verbal
Alpha values	0.95	0.89	0.85

Thus, with alpha values ranging from 0.85-0.95, the scales in the study can therefore be considered as reliable. Semi-structured interviews were also conducted with selected participants from the said community to provide further in-depth explanation of perceptions on communicative competence of technical oral presentations. The qualitative feedback provides the depth of participant respondent construct of communicative competence requirement in higher education and language learning (Duff, 2007, 2008a, b; Figueiredo, 2008).

RESULTS AND DISCUSSION

The research findings of this study provide valuable insight on engineering students' perceptions aut effective presenter skills and attributes required for the successful delivery of technical oral presentations. The three dimensions in final year engineering project presentation include:

- Presenter skills and attributes which emphasized on technical competency, methodology, organisation, layout, visual presentation, audience analysis, interaction with audience, presentation skills, delivery, clarity, creativity, confidence, fielding questions and humour
- Language skills which focussed on usage of complex terms, grammar, pronunciation, technical jargon and diction
- Non-verbal attributes which included eye contact, stance, vocal variety, vocal fillers and culturally observant

Quantitative analysis

Finding 1: Presenter skills and attributes: For the first dimension on presenter skills and attributes, engineering students are of the opinion that such skills and attributes enhance the effectiveness and delivery of a presentation. The students are of strong agreement and consensus that effective presenter skills and attributes are a combination

Table 3: Presenter skills and attributes in technical oral presentation (In%)

	Presenter skills and attributes (in%) (From highest to lowest)				
Items	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Confidence level	51.0	41.0	5.0	3.0	0.0
Methodology	41.5	48.0	9.0	1.0	0.5
Visual presentation	40.0	51.0	7.5	1.5	0.0
Audience receptivity (technical jargon)	38.0	52.0	10.0	0.0	0.0
Visual appeal	35.5	54.0	9.5	0.5	0.5
Presentation skills: analogy	34.0	58.5	7.0	0.5	0.0
Delivery style	32.5	51.0	14.5	2.0	0.0
Audience receptivity (non-technical jargon)	32.5	47.0	18.0	2.5	0.0
Synthesize contents	31.0	56.5	12.5	0.0	0.0
Technical competency	29.0	59.0	12.0	0.0	0.0
Organization	28.5	57.0	14.5	0.0	0.0
Creativity	23.5	54.5	19.5	2.0	0.5
Question and answer	22.0	61.0	15.5	1.5	0.0
Humour	16.0	40.5	35.5	7.0	1.0

Table 4: Language skills in technical oral presentation (In%)

	Language skills (in%) (From highest to lowest)				
Items	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Avoid complex terms	40.0	50.0	9.5	0.5	0.0
Pronunciation	31.0	61.0	8.0	0.0	0.0
Diction	27.5	66.0	6.0	0.5	0.0
Enunciation	26.0	61.0	12.0	1.0	0.0
Language choice	24.0	64.0	9.0	3.0	0.0
Articulation	23.5	60.5	15.5	0.5	0.0
Grammar	19.5	55.0	20.0	5.0	0.5

of several items such as listed in Table 3. From a student perspective, such presenter skills and attributes are essential for a presentation.

- In this dimension, students have highly rated the first three items, namely, confidence Level, methodology and visual presentation (ave 40%). Out of 14 items, confidence level is rated highest while humour is rated as the lowest. This finding echoes communication studies findings with similar emphasis on confidence and use of chosen genres in the delivery of presentations (Almeida, 2004; Darling and Dannels, 2003)

Finding 2: Language skills requirement: The students are also of the opinion that presenters must possess adequate language proficiency as indicated in Table 4.

This finding indicates the importance to avoid the use of complex items and need for correct pronunciation in technical oral presentations. These two items have been rated at 50% agree and 61% agree respectively. Other items such as diction, enunciation, language choice, articulation and grammar have been rated around the same level (19-28% strongly agree and 55-66% agree). Students perceive the need to use simple language to ensure the effectiveness of a presentation. From a students perspective, a presentation must be easily understood.

Finding 3: Non-verbal attributes and skills: The third important dimension as perceived by the students' is that of non-verbal attributes and skills (Table 5).

Students are of the construct that non-verbal gestures accentuate the effectiveness of a presentation. The above finding concur with other oral communication studies (Campbell *et al*., 2001; Moretto, 1996; Palmer and Slavin, 2003; Radzuan *et al*., 2008b) which state the importance of dy language, tone, eye contact, movement, voice projection, facial expression, volume and speed, articulation and pronunciation, correct grammar and style, vocal variety as essential aspects in evaluating technical oral presentations (Radzuan *et al*., 2008b). The quantitative feedback enables language communication lecturers to understand the students perceptions of important skills required for successful delivery of technical oral presentations.

Qualitative analysis: The researchers also interviewed ten volunteers from the questionnaire respondent group to obtain in-depth views on the importance of communication skills required in technical oral presentation. At the same time, ten engineering lecturers and five professional engineers shared their views on effective technical oral presentation. Some of the key findings of the qualitative feed back are discussed below:

Table 5: Non-verbal attributes and skills in technical oral presentation (In%)

	Non-verbal skills and attributes (in%) (From highest to lowest)				
Items	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Rate/pace	34.5	57.0	8.5	0.0	0.0
Appear extemporaneous	33.0	53.5	11.0	2.0	0.5
Volume	32.5	57.5	9.5	0.5	0.0
Facial expressions	32.0	51.5	15.0	1.5	0.0
Stance	30.0	56.0	12.5	1.5	0.0
Non-verbal gestures	28.0	56.0	14.5	1.5	0.0
Vocal variety	27.0	59.0	11.5	2.0	0.5
Pause	26.0	53.0	18.0	2.5	0.5
Vocal fillers	19.0	50.0	26.5	3.5	1.0

A comment by student A was:

- To be confident, a speaker must first understand his topic...what is the topic about

This student commented on confidence and a presenter's convincing ability to ensure that the audience understands a presentation. The student also mentioned the importance of fielding questions posed by the audience. The student's view confirms the quantitative finding on confidence level and audience receptivity as shown in Table 1.

An awareness of cost effectiveness of a chosen material is some of the factors mentioned by Student B. This perception is reflective of a participant in the professional engineering community of practice where decisions are economic and profit laden for the benefit of the organization. The student's views corroborate with the quantitative finding where in-depth understanding is characterized by synthesis of contents, analogy (Table 3) and diction (Table 4) when presenting.

Student B commented that:

- The economic knowledge is useful to justify the product or material being presented. One must try to provide reasons for a choice in an experiment, example why the use of material X and not Y. This knowledge is useful when answering questions by my examiners or people from the industry

This feedback shows that in some cases, a presenter must be prepared to enhance and apply real life application and cost elements to a project presentation for the benefit of the audience knowledge and probable decision-making purposes. He is also expected to have fundamental and additional knowledge of a subject matter to support or defend his idea. The feedback supports Lave and Wenger's learning and identity and learning construct perceived by selected participants from various communities of practice where views expressed are reflective of the participants' legitimate peripheral participation and immersion in a said discourse community (Lave and Wenger, 1991; Wenger, 1998). In an interview with Lecturer A, the comment was:

Positive attitude, proactive approach and initiative are essential attributes expected of a student if he or she wishes to present confidently.

This feedback enhances speaker confidence and presenter attitude as mentioned in Table 1. The lecturer also mentions the importance in using technical jargon with a varied audience as different implications can arise when such terms are used. This finding confers with audience receptivity when using technical jargon.

One engineer employee (Engineer A) commented that:

- The students ability in understanding a topic is an essential element of importance to enable a student to present convincingly to his audience as this allows the student to capture the bigger picture and not look at an issue from a microscopic level

Engineers expect students to have a wide understanding of the subject matter. Engineer B from the Board of Engineers stressed fervently on knowledge management skills as a crucial skill requirement as engineers are not merely tools or workers of an organization but potential leaders. From a professional boards perspective, as a result of globalization of industries, engineers must possess oral communication skills, project management skills, presentation skills, time management skills, convincing skills and leadership skills to succeed effectively in the workplace. Language courses need to theorize workplace communication skills and attributes to ensure that real life and authentic learning takes place in the classrooms as students require new skills to flourish in tomorrow's workplace organizations (Thomas, 2007). The feedback provided concurs with Lave and Wengers model of identity construct and learning where views expressed are reflective of the participants participation and immersion in discourse community. The findings indicate that

although sufficient presentation skills, language skills and presenter requirements are provided to the students, further enhancement can be provided to enhance the communicative competence of these students to meet workplace and employer expectations. The comments on existing language courses and input provided indicate the need to enhance presentation skills, language requirement and non-verbal aspects to meet workplace expectations and requirements. In this context, students need to improve on their presentation skills to be more competent and confident speakers.

CONCLUSION

The findings has attempted to provide useful insights of communicative competence requirements of different discourse communities (like students, academic lecturers or employers), which may reflect the perception of a said participant in a particular discourse community. The findings are useful to suggest enhancement in the teaching/learning and development of ESP materials so that each participant of a discourse community can achieve their own goals for effective workplace participation. Students feedback reveals positive indication with a call for enhancement in the current written and oral language courses offered in the university. With closer collaration between the engineering community and academia on written and oral communication pedagogy, it is envisaged that students will develop necessary communicative skills required for effective communication in the 21st century workforce.

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