TEACHING ACADEMIC WRITING FOR ENGINEERING STUDENTS: CHALLENGES AND RECOMMENDATIONS

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Abstract: *Academic writing involved multifarious tasks ranging from writing assignments, case studies, technical reports, laboratory reports, examination questions through writing articles in journals to final year thesis. It is vital for engineering students to excel in academic writing. Nevertheless, academicians are sometimes frustrated that the performance of students in academic writing. There are complaints from employers about the poor writing skills among engineering graduates. Generally, there are three aspects that students who study engineering face difficulties when writing academic articles in i.e. content, structure and language. As such in order to enhance the quality of academic writing among students, these aspects must be taken into consideration. This paper presents a preliminary investigation on the challenges faced by engineering students at the Faculty of Electrical Engineering, Universiti Teknologi Malaysia in producing high quality academic writing and proposed recommendations as well as strategies in order to remedy the problem.*

Keywords: *Academic Writing, Challenges, Engineering, English, Teaching*

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Introduction

It is vital for those who endeavoured to be engineers to be skilful in writing. Students must be made aware of the importance of academic writing so that they take it seriously. Writing is one way of conveying out thoughts to other people. Academic writing is a means in which others will be able to explore our thoughts. Through academic writing, students can demonstrate their understanding of the knowledge, skills and experience that they have acquired. In addition academic writing enhanced creativity and analytical skills, teach students to plan well and think in an objective manner, strengthen their presentation skills and enable others to comprehend what the students think. It also provides a link between the theoretical world and the practical world. Academic writing allows a student to apply the knowledge that they have learned in real

life. Academic writing assists to induce students into the discourse of subjects in the universities. Students will be able to present complex ideas in a formal order or structure and make them think systematically.

Academic writing is not just valuable when the students were at the university but also when they are working. Graduates must have certain skills in order to be employed. One of the skills that is lacking among graduates and which has always been mentioned by employers as the reason why they do not employ them is the weaknesses in writing such as preparing a technical report. The situation is more critical in the private sector in which companies are competing against each other and as such they would like to employ graduates who have the right skill to assist the company. Many surveys have been conducted to find out what the employers want and the findings show that the industries always complained about the poor writingproficiency especially among fresh graduates. This occurred because the graduates do not work hard enough as they should do in writing (Md Yasin et al 2010).

From time to time lecturers often expressed their disappointment about the quality of academic writing among students. Lectures always complained that they find it difficult to understand the students writing what more if the writing is done not in their native language and also the writing involved technical terminologies i.e. engineering terminologies. There are a lot of discussion among academicians on why the quality of academic writing among students are not up to the standard that they expected. There are also many articles discussing about the weaknesses of students and the strategies to tackle them. Some even think the quality of writing between the current students and students in the past decades have deteriorated. Although today students have the luxury of technology such as the internet to assist them in learning academic writing and gaining valuable information which can help them in writing, yet some of them use the internet mainly for non-academic purposes. Employers also complained that the writing quality of engineering graduates is not of sufficient standard (Oakley et al., 1999). Many engineering students do not fully know the expectation of their employers and they think that knowledge in engineering is sufficient for them when they join the workforce. So many of them do not take academic writing seriously. On the other hand students complained that the lecturers expect too much from them when in fact they are struggling to familiarize themselves with the academic environment. They felt that the transition from school to the university is a huge burden upon them. The students felt that the task of understanding the engineering subjects itself is a huge task to cope with. Hence many of them felt that the requirement of academic writing adds to the current burden.

Lecturers have years of experience in academic writing and they have read many high quality academic writing. When they compared the excellent academic writings and the ones that the students wrote, they felt that the gap is wide. However they must understand that students need time to familiarize themselves. It is true that sometimes students are not committed to their work but the factors that lead to such weaknesses must be examined and treated properly. One of the reasons is because students do not have much exposure to academic writing and because lecturers teaching engineering focused more on the content aspect rather than the development of writing skills in students. There is a perception that if lecturers allocate some of their time to teach writing skills, this will result in the reduction of allocation in core content teaching and learning. Nevertheless by developing academic reading and writing skills simultaneously, this will indirectly strengthen students' comprehension of core content (Wheeler and McDonald, 2000). Before entering universities, students are not trained properly in academic writing. At schools they are trained to write according to what has been taught in the textbooks and reproduce it again in the examination. As such students are not well trained to think creatively

and critically. Since there are many students in the classroom with various background, it is difficult for lecturers to give proper attention to students in harnessing their writing skills.

It is fair to say that academic writing is a challenging task (Cismas, 2010). In addition the challenge is greater when the students study at higher education institutions where there is a high expectation that they will be excellent in academic writing. This paper will look into some of the problems and challenges facing university students in Malaysia in academic writing. It also proposed recommendations and strategies which will alleviate these problems. The respondents in the research are students in the Faculty of Electrical Engineering, UniversitiTeknologi Malaysia.

Literature Review

One of the major weaknesses in student writing is poor proficiency of the English language, poor sentence skills, core content, structure of writing, academic writing conventions, analysis of writing topics; ability to conduct research and apply knowledge across different context (Pineteh, 2014). Such weaknesses can be observed among students who study subjects such as engineering in which some students regard academic writing not important compared to the core content. As such writing is ignored as it is considered not beneficial for their future career. It is not surprising to find many of them struggle to produce good academic writing. Writing is also considered trivial and sometimes is not seen as directly assist students in understanding their discipline. As a result there is an increasing "marginalization of writing from mainstream curricula" especially in universities which specialized in science and technology (Archer, 2010). In some cases, academic writing is taken seriously only when students embarked on postgraduate study in which they have to publish their research findings in journals which require that articles reached a certain standard in order to be published. The challenges and problems in academic writing faced by engineering students in universities are due to their linguistic and literacy settings, their stance on academic writing and universities giving privilege to middle-class literacy practices. As an example, students at the universities are presumed to have excellent English language and high level of thinking skills e.g. logical and critical thinking as well as analytical and innovative skills. Nevertheless, in recommending for these high level thinking skills, universities are usually not aware or not concerned about the schooling experiences of students and how they have an impact on their writings in the university (Pineteh, 2012). So students who came from background where English is practiced at home every day what more those who have the privilege of attending various English language proficiency courses to sharpen their language skills will have an advantage compared to those who do not have such experience. Hence there is a wide gap between the haves and the have nots. To express this more articulately academic writing is a literacy practice rather than a skill as writing in higher education is not merely "a set of neutral methods that are separate from the social context..." (Archer 2010). Discussion on the problem of English language proficiency among students in Malaysia has been going on for decades. The discussion has been exhaustive and until today no effective solution has been found. Many investigation has been conducted to find out the reasons why this problem occured. Many analysis has been made and many people think the proficiency level is deteriorating.

For non-native speakers academic writing in English is a challenging task who are in the transition period from secondary education to tertiary or university education. (Fong et al., 2009). Some of the students faced difficulties in preparing good academic writing in English when they were studying at the secondary schools and these students bring their problem to the

universities without any proper treatment or remedy. As English is the not the main language spoken by most of the population and the students came from diverse backgrounds as well as diverse learning experiences, these as well as other factors have an influence on the students proficiency in English (Musa et al, 2012) and consequently their academic writing. The students faced double challenge as they not have to cope with understanding new subjects at the university but also the ability to understand English which is used as the medium of instruction. Although they have learned English for eleven years during their primary and secondary education, they still faced enormous challenge in understanding English which is used at university level. They have to understand the core subjects although most of the references are not in their native language and there are many new technical jargons and terminologies that they have to understand. They also have to acquire the writing skills especially in their discipline and be good in using the relevant references. The situation in the university is different from the situation at schools whereby at schools, they do not study academic English in an explicit manner (Wong Sowat, 2013)

Investigations have shown that the reasons for the poor writing proficiency are: (1) problems related to the teachers themselves for example poor attitude, insufficient pedagogical skills and knowledge, (2) technical aspects needed in specific skills, (3) the teaching and learning processes utilized the wrong teaching strategies and (4) unsuitable assessment. Usually the problem is related to either the teacher or the teaching process. Some of the problems are partly related to the teacher as well as the teaching and learning processes and some also due to the students themselves (Kamaruddin and Abdullah, 2015). The teachers or the lecturers cannot be totally blamed for the students weaknesses as some of the students are not motivated and do not pay attention in the classroom. Some of the teachers are very dedicated and they made a lot of effort to improve their teaching methods. The teachers also have to handle many students such that they cannot pay attention to each student.

Attitude also plays an important part. Students often do not get assistance from the lecturers when do not understand the requirements of academic writing. They make certain assumptions without getting a clear picture of what is expected from them. Many students submit a final draft without revising the first draft substantially. They also did not do anyperform a review or proofread as well asperform a spellcheck before submitting the final draft. Sometimes they are given a long period of time to do the writing, but they ask the lecturers to give them concessions at the early stage of the writing even if it means lowering the quality of the writing. In terms of formatting occasionally they use bizarre, tiny or oversized fonts (in order to hide the true length of the writing assignment) or useextra space between the paragraphs.

Plagiarism is common in academic writing. In their hastiness to complete their writing, some students resort to copying others. Sometimes the level of plagiarism reached a level where they even copy the mistakes contained in articles which they referred to. They do not appreciate the fact that plagiarism means stealing intellectual material (Devlin, 2005). It can be observed that the content of the writing assignments between the students is identical. They copied the ideas taken from other students and submit them as if it is their own. In terms of group assignment a few of them did not contribute much or did not contribute at all but they got equal share of the marks. In addition they copied the work done by other authors sometimes copying them word by word.

Theoretical framework

In general there are three aspects that students who study engineering face difficulties when writing academic articles in i.e. content, structure and language. Some researchers have found that weaknesses in language is the biggest problem followed by weaknesses in content or subject and last obstacle is in planning the structure of an article. These difficulties must be taken in implementing any effective strategies so as to eliminate or minimize them (Xiao and Chen, 2015).

One of the strategies adopted in this project in order to improvewriting skills is to focus on the macro scale aspect of the problem which is to develop students analytical skills which represents the 'bigger picture' of writing skills development by motivating students to develop their skills inanalyzing the subject, utilize the language in a creative manner and have a proper planning so that the content and the language can be combined to develop a suitable academic style in writing. In implementing this strategy the development of academic reading and writing skills are also taken into account as they can also strenghten student comprehension of core content (Wheeler and McDonald, 2000). This approach can be implemented without adding any extra hours to the existing students time table. It can also be incorporated in a limited amount of time available within the existing lectures classes. In the past writing skills are taught in the English subjects by lectures who are good in English but who are not well-versed in engineering. As such students do not have much opportunity to link the writing skills with writing in the engineering context.

There are many researches which show that by merely exposing and teaching vocabulary, grammar, discourse and academic writing is not the most effective methods of enchancing academic proficiency (Hinkel, 2002). There is a difference between writing for writing lessons and writing for specific discipline. What is important in writing for writing classes is not the same from what is vital in writing for other discipline (Leki and Carson, 1997). Teaching academic writing in English must make sure that students are provided with linguistic and writing skills which will allow the students to encounter, manage and come to terms with new information as well as expand their knowledge base (Leki and Carson 1997) Research on non-native speakers who are highly proficient in English also show that merely providing them with huge amount of reading and training in academic domain does not guarantee that they will be competent of discourse and sentence-level linguistic characteristics of academic writing. There is also no guarantee that in such situation they will be able to acquire the necessary academic writing skills. As such it is vital that the students are given explicit instruction and guidance in academic writing and text at the advanced level. (Chang and Swales, 1990) Extensive, detailed and focused guidance in academic vocabulary, grammar and discourse which is tailor-made for a particular discipline is vital for developing non-native speaker skills in academic writing. Various research has shows that academic writing in English is based on various rigid rules in its discourse structure and language characteristics. As such the methods and strategies in teaching academic writing which has the objective of maximum gain for minimal effort should utilize those rigid conventions (Hinkel, 2004)

Plenty of practice would enhance academic writing skills. Enhancing academic writing skills should not be implemented unilaterally in the sense it is not just lecturers giving lectures on what the students should write. The students should be taught with the techniques of academic writing, analyzing the subject whether individually or in group, and individual assignments. In the early stage of an academic writing program, they can being given articles related to the

subject. They will be given time to read and digest the content and then should write a summary and present them in front of their classmates.

Students should also be made aware that the language used in academic writing is formal and some writers generally described is as more densely 'packed' than informal language (Martin, 1997). They should be able to differentiate between formal and informal language. This is a big challenge for the non-native English speaking students as they faced at least two major problems i.e. understanding the content and understanding the language. If the article is densely-packed with information, the students will find it difficult to understand. This is in contrast to informal language used in conversations where the language is much simpler and less abstract. To tackle this problem it is inevitable that students have to 'unpack' it or simplify it by changing abstract nouns into a more conversational form (McGowan, 2005). This is a good practice in imparting the students with the necessary skills and experience in unpacking an academic reference which is full of technical content as well as jargons and can be utilized to help them perform academic writing. They can also perform the reverse process in which they repeat the process of packing the information and ideas from the informal level to a formal level (Ventola, 1996).

Another method of acquiring the academic style of writing is by imitating other academic writings. This technique has been termed as 'harvesting language' (McGowan, 2010). In this way the other language or writing is deliberately 'borrowed' (Pennycook, 1996). In this method students adopt the learning strategy whereby they read, understand and imitate the way other academic articles are written through the comprehension of the the structures and language patterns used in a specific discipline and for a particular writing task (McGowan, 2005). In order to achieve this students have to analyze as much as possible relevant academic writings and take note of commonly used expressions that are suitable to be utilized in their own writing. It is through this way that students can enchance their writing skills and internalize the structure and language that are commonly used in their academic discipline much faster.

In order to produce a high quality academic writing students have to critically read the works of other writers, and to incorporate their ideas into their writings. Students must acquire the reading skills so that they can comprehend the content. Students will not be able to write well if they did not read well. In fact many research has found that it is the most vital skill for content area courses. It is not sufficient for lecturers to deliver lectures and ignore their students reading capability. Students should have excellent reading skills so as to smoothen the process of transfer of knowledge. Another aspect that has always been ignored is the listening skill. If the students listen well to what the lecturers have taught, the information they gained by listening can be well processed by their brains (Gozuyesil, 2013).

In academic writing, there are common discourse and textual features across disciplines. Johns (Johns 1997) Text, role, and context: Developing academic literacies: Cambridge University Press) state that these characteristics comprises four purposeful introductory activities with the aim of preparing the students to read and comprehend the reference material effectively. These activities are:
1. Familiarisation with the topic and discuss why it is important,
2. Examine various sources of facts,
3. Laying the foundation and argument for the current analysis and/or synthesis of facts (or show the accomplishment of the current examination which was not achieved by the preceding examination), and
4. Bring out the present examination and mention its objective.

In motivating students and reducing the language anxiety among students, teaching should establish a competitive spirit among the students especially when they are doing their writing task. In addition, lecturers can increase their confidence in listening, reading and writing activities by giving many opportunities of getting success in the classroom and avoiding actions which resulted in frustration. Lecturers should also attend to students' confidence by giving the opportunities to the students to gain success, to give feedback without being humiliated, and to give praises for betterment which they made. Positive lecturer–students' interaction should also be developed so that students view lecturers as being open-minded to accept their weaknesses. When the lecturers give feedback to them, the feedback should be written clearly and if possible appropriate examples should be given. There should also be English speaking activities (i.e. oral academic presentation) because lack of opportunities and application outside the lesson to communicate and write in English could be one of the factors that make the students unconfident(Kamaruddin and Abdullah, 2015). Research have shown that students can solve their problems including academic writing via a combination of ambition, dedication, determination, enthusiasm, strong motivation, hard work, effective learning methods, and concerned peer networks (Berman & Cheng 2010).

Research Methodology

The research is conducted under the projectentitled 'Project-based intensive academic writing for engineering students'which is being implemented at UniversitiTeknologi Malaysia.The project is being carried out in four phases i.e. (1) Exploration phase, (2) Model Development phase, (3) Model Experimentation phase, and (4) Dissemination and Model Implementation phase. In the Exploration phase, an extensive literature review, laboratory and classroom observations as well as preparation wascarried out. The aim of the literature review is to extract as much as possible the latest research and approaches that can benefit this project. In this phase also, research was also carried out on how this knowledge can be implementedon the students taking into account of the learning environment at Universiti Teknologi Malaysia. Planning for the academic writing was also undertaken in this phase which includes defining skills needed by lecturers and students, identifying the weaknesses of students and lecturers, determining course sequence, and developing suitable experiments to be performed by students. In the Model Development phase, the aim is to develop a preliminary form of the academic writing course that can be field-tested. The preliminary form will be structured so as to obtain as much feedback as possible from the field tested. Limited experiments will be carried out on students to observe the effectiveness of the preliminary form. The experiments will be carefully monitored and evaluated. The experiments provide vital information which can be used to identify any deficiencies and also provide clues on how they can be overcome.

In the Model Experimentation Phase, a preliminary field testing will be carried out. More experiments on students will be performed. Data from interview, observational and questionnaireswill be collected and analysed. Finally in the Dissemination and Model Implementation Phase, there will be a revision of the academic writing prototype based on the results from the preliminary field-test. The main field testing will be carried out in which more students will be evaluated and quantitative data on the students' performance will be collected. The results will be evaluated. Two courses are being chosen for this research i.e. Instrumentation and Electrical Measurement as well as Industrial Instrumentation and Applications. Instrumentation and Electrical Measurement is a core subject whereas Industrial Instrumentation and Applications is an elective subject taught at the Faculty of Electrical Engineering. The authors have taught both subjects for more than twenty years and made use of their vast experience to guide the students. So far in the project students have been given the

opportunity to conduct small or mini projects related to their courses. Then they are required to submit technical reports as well as articles for journals based on their projects. The findings and materials prepared in this research are used to guide the students. Up till now, observations show the project provided a good opportunity for the students to become mature in academic writing. The rigorous program conducted on the students enabled the students to discover their weaknesses and motivate them to solve them. Interactions with the students while guiding them show that the students admitted that they lack certain soft skills including academic writing. From the survey given to the students, some of them realized that soft skills such as writing are largely learned through experience and by interacting with others.

For the purpose of validating the proposed model, the academic writings produced by the students before (pre-model) and after (post-model) undergoing the academic writing program will be assessed by independent lecturers/readers (ie experienced lecturers who are not part of the project team) to observe if the model achieved its objective. Readers will be asked to read the pair (pre-model and post-model writings), decide which writing is the better writing and then list what made one better than the other. The "paired comparison" method will give information about how much the students has progressed after undergoing the program and will give a clear picture about the effectiveness of the program/model.

Results and Discussion

Table 1 presents the results of a survey among the students. The students were given three questions to answer based on an assignment given to them. They were given nearly two hours to complete the assignment. The assignment was not straightforward as they were required to propose a measurement system to detect flood.

Table 1

Questions	Very difficult	Difficult	Moderate	Easy	Very easy
1. Do you think it is easy to come up with ideas in preparing the task?	22.6%	32.3%	29.0%	16.1%	0%
2. Is it easy or difficult for you to write this task in English?	9.7%	16.1%	48.4%	19.4%	6.5%
3. Is it easy for you to organize the content of your ideas for this task?	19.4%	29.0%	32.3%	9.7%	9.7%

In terms of content, observations show that the students have different levels of capabilities. Some of the students understand what they have to do and are creative in laying out the content whereas others are not clear on how to organize the content. The following example is taken from a student's essay on the importance of measurement, "The measurement important because measurement will make the thing to be fully functional." This example illustrates that besides weaknesses in the English language, the sentence also contained ambiguity in which the student mentioned 'thing' instead of for example 'instruments' or 'equipment'. Another example is the sentence, "If the (current) measurement is wrong the device can exploded". The word 'exploded' is an exaggeration and the proper word should be 'break down' or 'damaged itself'. Another example of incomplete content is the following sentence, "Measurement is important as we require the exact amount of some substances to ensure the effectiveness". The sentence does not have a proper ending and it could be rephrased as "…the effectiveness of a process".

Proficiency in language shows that students have different levels of English proficiency. As an example of a low level of English proficiency is the following sentence taken from an essay written by a student, "A good measurement is needed to prevent from high cost or loss". Such sentence shows that the student has an idea on the importance of measurement but poor English proficiency caused the student to write in a haphazard manner. Another example is," For example, when architect want to design a house, they must design follow the cost although the company will get loss". The student was probably is his or her native language and then attempts to translate it into English. The student has a vision about the task of architect but he could not express it properly due to weaknesses in the English language. The use of verbs and the structure of the English language might pose difficulties to some students who are not familiar with the way verbs are used in English. Another example can be observed in the following sentence, "If we intake too little amount of medicine, it would not be enough for us to cure". The use of the words "intake" and "cure" shows that some students have vague ideas about the use of the right verbs.

Conclusion

Teaching academic writing is a challenging and complex task as students came from various background with multifarious problems. It is important that lecturers and students are aware that teaching and learning academic writing is a process which takes time to have mastership over it. Hence all parties concerned must be patient and diligent in making sure that academic writing skills are smoothly imparted to students. The academic writing project not only benefit the students but also benefit the lecturers as they can make use of the project to improve the delivery of the lectures.

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