

## **Developing the Ecosystem to Enhance Engineering Students’ English Language Abilities**

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### **ABSTRACT**

English language teaching in higher education has become more challenging with the growing needs to address English language abilities of students of various fields of study. In Malaysia, English language practitioners at higher institutions hold the responsibilities of addressing the needs of English language competencies of engineering students to prepare these students for the language competency needs of working engineers in the real world. However, there may be limitations in developing these English language competencies within the walls of English language classrooms as English language practitioners may not have sufficient knowledge to contextualise English language teaching into engineering. Thus, an ecosystem is required within the engineering curriculum to provide opportunities for students to develop and apply their English language abilities within engineering contexts. One of the stakeholders that need to play a role in supporting the development of English language competencies in engineering is the engineering lecturers. This paper explores ways in which engineering lecturers perceive English language teaching and support the development of English language competencies in engineering education. Semi-structured interview sessions were conducted on three engineering lecturers from one public university in Malaysia. The data were transcribed, and thematic analysis was employed. The findings provide insights into the roles that engineering lecturers play in supporting the development of English language abilities of engineering students.

*Keywords:* English for engineering, English as medium of instruction (EMI), cross-disciplinary teaching

### **1.0 INTRODUCTION**

In today’s competitive and challenging world, having strong communication skill is a great advantage for fresh graduates to secure employment. This is because good communication skills have been identified as one of the main criteria that employers look for in their employees (Baird & Parayitam,

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2019). Communication skills are essential in the workplace as these skills determine the growth and performance of a company (Ab Rahman *et al.*, 2020). Employees with good communication skills are able to build positive relationship with others (Alkozei, Schwab, & Killgore, 2016; Tamunosiki-Amadi, Sele, & Ernest, 2020). The same is required of engineering graduates as engineers are expected to work in a team and build trust among team members (Saeed *et al.*, 2019).

English has been acknowledged as the language for global communication in the engineering industry (Shrestha, Pahari & Awasthi, 2016). In order to have the opportunity to be recruited in their prospective careers, engineering students need to have the competency in English (Krishnan *et al.*, 2019). Higher education institutions in countries where English is a second language (or a foreign language) such as Malaysia, hold a great responsibility in equipping these engineering students with the English language abilities for them to perform in respective workplace scenarios. A study has shown that Malaysian engineering students still do not have the competence and confidence to communicate well in English (Othman, Wahi, Ya'acob & Tan, 2017). Despite extensive efforts taken by the English language educators, the performance of engineering students in their English language abilities is still unsatisfactory.

In order to provide opportunities for students to develop their English language abilities, English language teaching and learning should go beyond the walls of the English language classrooms. An ecosystem is required to provide opportunities for the development of English language competencies among engineering students. Within this ecosystem, there is a need for various stakeholders to play their roles. This is where the implementation of English as the medium of instruction (EMI) by the engineering lecturers comes in. The use of EMI in engineering courses could provide a space for students to relate and apply the English language knowledge and skills that they have acquired in the English language classrooms. As such, there is a need to understand ways in which engineering lecturers' view English language teaching in engineering education and to what extent could they support the development of English language. This paper focuses on the ways in which engineering lecturers play their roles to support the development of English language abilities and communication skills among engineering students.

## **2.0 LITERATURE REVIEW**

Studies on English for Specific Purposes (ESP) have acknowledged the existing complexities in meeting the needs of students from various academic disciplines in English language teaching (Birlick & Kaur, 2020; Hyland, 2019; Turkan & Buzick, 2016). In equipping students with the English language abilities for engineering fields, academically and professionally, English language teaching needs to address a higher and more specific competency, rather than general English language abilities. This suggests that ideally, English language practitioners must have knowledge of the engineering fields so that they can appropriately address students' English language abilities in an engineering context (Luo & Garner, 2017). In addition, English language teaching needs to be domain-specific to enable students to relate to their field of study and participate in their language learning process (Sweller, 2021).

In order to provide specific English language to engineering students, English language teaching needs to be extended beyond the English language classrooms. English language practitioners in Malaysia generally went through teacher training programme to teach English as a second language (Bolitho, 2002;

Kabilan & Raja Izzaham, 2008; Ong *et al.*, 2004; Zeichner, 2005). These English language practitioners may have conflicts or tensions when they are required to teach beyond their expertise. In her study, Mohamed (2017) found that English language educators at one technical university in Malaysia understood the demand for teaching English for engineering. Despite this understanding, most of the participants decided to focus more on general proficiency as they lacked the knowledge about the discipline. In addressing the language needs of a specific discipline, the English language educators need to understand how to design an ESP course. This includes selecting the types of materials and the activities that they need to conduct in the classroom (Shalan, 2020). However, the way they conceptualise ESP may affect the design of an ESP course. In a study by Mohamed, Moni and Mills (2015), it was found that the participants who were English language educators, trained to teach English as a second language, demonstrated 'fuzzy' conceptualisation of ESP. With such 'fuzzy' conceptualisation, the ESP courses that they helped to design, and the teaching materials that they used were not specified for a specific discipline. This suggests that the selected materials and the tasks provided may not address the language needs of students of a specific discipline. Similar finding was also found in a study by Aliakbari and Boyagheri (2014). In their study, the researchers found that the participants who were undergraduate and post graduate students were dissatisfied with the ESP courses offered by the university as these courses did not address the language needs of the students in their respective discipline.

Addressing students' language needs is crucial so that they can function in their respective fields, academically or professionally. As English language educators may not have the knowledge of students' field of study, they may work with the content lecturers to provide meaningful language teaching and learning. In addition, students need an environment that could provide continuous support in their language learning. This highlights the need for an ecosystem that should assist the English language practitioners in dealing with English language for a particular discipline.

English holds the status as the second language in Malaysia and the Malay language is the national language. With this status, the medium of instruction in public schools and universities is generally Malay. In 2002, a language policy was implemented whereby English became the medium of instruction (EMI) for science and mathematics (Puteh, 2010; Rashid, Rahman, & Yunus, 2017). In higher education institution, EMI was extended to technical courses such as engineering. The purpose of implementing this policy was to promote nation building through a bilingual education system (Tan, 2005). In 2012, the EMI policy was discontinued in the effort of upholding Malay language and strengthening English language (Tharmalingam, 2012). Despite the fact that the policy has been discontinued, many public universities, particularly engineering faculties, still proceed with EMI. This effort is seen as supporting the development of English language competencies among engineering students by providing the much-needed ecosystem. However, implementing EMI in the teaching and learning of engineering content knowledge is complex.

In teaching content knowledge in English, the issue on how languages should be taught by content lecturers need to be considered. Teaching English through content learning demands for the engineering lecturers to acquire pedagogical knowledge of English language teaching (Inbar-Lourie, & Donitsa-Schmidt, 2020). A question arises about how much knowledge is required of an engineering lecturer to teach English through content learning. In addition, engineering lecturers would also need to recognise and understand student language learning anxiety. In a study conducted by Radzuan and Kaur (2011), for example, it was found that students experienced anxiety when they have to present technical knowledge in English, particularly when they have limited English language proficiency. This dilemma calls for an examination on how engineering lecturers play roles in fulfilling the EMI policy and how they support the development of engineering students' English language abilities.

### 3.0 METHOD

In order to address the objectives of this study, the researchers recruited three engineering lecturers from one technical university. Each participant was individually interviewed using semi-structured type of interview. Each interview which lasted for about forty-five minutes, obtained information related to their educational and research background, their perceptions of English language teaching and their teaching practices. The data from the interview were transcribed and analysed using thematic analysis to provide understandings of ways in which engineering lecturers positioned English language education in engineering curriculum.

#### **The Profile of the Engineering Lecturers**

In this study, three engineering lecturers from two engineering faculties were interviewed. The results provide an understanding of ways in which they perceive English language education in engineering curriculum and the extent to which they implement EMI in their teaching.

The first lecturer, Amin (pseudonym), specialised in communication engineering and had been teaching at this university for 16 years. He did his first degree at one of the universities in the USA and his master's degree locally. He taught satellite communication and electromagnetic theory courses. The electromagnetic course was considered as a difficult course as it involved theories in engineering and additional mathematics.

The second lecturer, Razak (pseudonym), had qualifications in electronic engineering, focusing on communication and computer engineering, as well as computational electromagnetic. He graduated from a local university that used English as the medium of instruction. His research interests included antenna designs and radiation impacts of mobile phones, and wireless communication. He had research collaborations and networking with a number of the telecommunication companies in Malaysia. He teaches electronic communication system course.

The third lecturer, Derick (pseudonym), had qualifications in civil engineering focusing on structures and material. He obtained his bachelor's and master's degree locally and his doctorate at one of the universities in the UK. His area of specialisation was timber and steel designs and he taught structures and materials course.

The profiles show that all the participants had experienced using English as the medium of instruction in their learning. Therefore, it can be concluded that these participants may not have any issue in teaching engineering content in English.

### 4.0 FINDINGS AND DISCUSSION

#### **The Role of English Language Courses in Engineering Education**

At this selected university, there were four English courses that were compulsory for all engineering students to attend. While these courses were designed to address the language needs of the engineering students, the relevance of these courses from engineering perspective needs to be examined.

*The English courses are good. They help the students a lot. Each course has its own level.*

[RPIEEEHMRazak]

In his response above, Razak seems to understand the role of the English language courses in developing students' English language abilities. In addition, by acknowledging that each course had its own level, it also suggests that Razak understood the purpose of each course. Based on this finding, it can be concluded that the English language courses offered have addressed the language needs of electrical and electronic engineering students. Derick, however, may not agree to this conclusion.

*Having the English language courses in the engineering curriculum might help (in improving students' English language abilities in engineering)...all the reference books are in English... whether they like it or not they have to speak English well.*

[RPICEEHMDerick]

Derick does not perceive the English language courses as the main contributing factor to the development of English language abilities among engineering students. He believes that students themselves should have the willingness to use the language for them to improve, regardless of what their attitude towards English is. In this instance, Derick has positioned the students as the main role in their development of English language competencies and the English language courses may only be effective when students play this role.

Based on the above findings, the effectiveness of the English language courses in addressing the English language needs of all the engineering students at this university needs to be further examined.

### **English as a Medium of Instruction in Engineering Education**

Malaysia has implemented a language policy of English as the medium of instruction (EMI) where science, mathematics, technical and engineering courses need to be taught in English in higher education institutions (Ali, 2013; Kirkpatrick, 2017). Based on the findings, it can be assumed that the participants have conformed to this policy as they acknowledge the importance of English in engineering fields and use the language in their teaching and learning in their lectures.

*When I teach, I teach in English. I think it is more convenient. All the references are in English.*

[RPIEEEHMRazak]

The use of English as the medium of instruction was due to the fact that the majority of the references were in English, making it convenient for Razak to get the students to relate his teaching to the references. Amin argues that it is better to explain in English "because it is precise and accurate" [RPIEEEHMAmin]. Therefore, students should be encouraged into using the language during the teaching and learning process.

*I interact (with the students) mostly in English although most of them are Malays who mostly speak Malay. Some of them can respond (in English) but if they respond in Malay I just keep using English to discipline the students.*

[RPIEEEHMAmin]

In this instance, Amin is persistent in requiring the students to use English in his classes. However, the extent to which English could be used in engineering classrooms depends on the situations. Although he uses English in his teaching and learning, there were times where he had to switch to the use of Malay.

*When I make jokes, the jokes need to be in Malay. Because the students cannot understand jokes in English. When I make jokes in Malay, they can understand.*

[RPIEEHMAmin]

In order to understand and appreciate jokes, students need to have sufficient proficiency in English (Chen & Dewaele, 2018). In Amin's case, he believes that the students do not have sufficient vocabulary that could hinder them from understanding jokes. Therefore, using Malay was an option he chose to deliver the jokes.

Another participant, Razak, responded that 90% of his teaching is in English. There were times when he had to resort to using Malay when explaining about complex concepts. This was mainly because students seemed lost when he tried to explain in English. Thus, the need to intervene with the use of mother tongue was necessary.

*At the beginning of the lesson, I will interact with my students in English. When students do not respond, then I will use Malay Language*

[RPIEEHMRazak]

The use of English language as the medium of instruction (EMI) in engineering education may serve as a barrier for engineering students to understand the content of a course. In the above case, students' mother tongue was used to assist in their understanding of complex concepts. The above findings support a study conducted by Che Musa *et al.* (2012) that reported participants' limited proficiency in English interfered with their understandings of the content although the language used was simple.

One of the lecturers posits that the main reason for students' challenges in understanding engineering content in English was due to the fact that the students did not sufficiently read materials in English.

*Our students do not read enough. If they read, I think it would be OK. Like this magazine. The language is simple.*

[RPIEEHMRazak]

He believes that the English language for engineering is not complicated.

*To me, English for engineering is simple. You only need the key points, then you connect these keypoints to make sentences. Use passive voice. Use past tense. It should be OK, actually.*

[RPIEEHMRazak]

In this instance, Razak views English as mechanical in the sense that it has a specific structure or template, focusing specific aspects of the language that students can use to communicate their ideas well. In other words, there is a specific English language discourse that students need to learn. Othman *et al.* (2017) posit that "there is a need to understand the relationship between ESP (English for Specific Purposes) classroom practices against professional discourses and professional practices".

Engineering lecturers need to provide opportunities for students to develop their English language abilities in their English classrooms. This could allow the engineering students to relate language skills that they have developed in the English language classrooms to their engineering contexts. This raises the need for content alignment between English language and engineering courses to make English language learning more meaningful.

Questions arise in relation to the alignment between the English language developed in English language courses and the English language used in engineering education and workplace. On the one hand, this finding suggests that engineering students need to develop specific type of English for them to survive throughout their study. On the other, questions arise in relation to the sufficiency of this type of English in allowing future engineers to communicate with the community at large which is one of the outcomes stated in the manual of the Engineering Accreditation Council (EAC).

### **The Support for the Development of English Language Abilities in Engineering Education**

Based on the responses, it was found that the space that supports the development of English language abilities in engineering education was provided.

*The course I'm teaching is for final year students. In my classroom, I usually implement problem-based learning.*

[RPICEEHMDerick]

Problem-based learning is an approach that focused on investigation which requires students to perform discussions and expressing opinions and ideas (Gorghiu, Drăghicescu, Cristea, Petrescu, & Gorghiu, 2015). Within this context, a space for students to interact and improve their English language abilities is available.

*One of the assessments is the project...the students must be actively involved in real design work...they have to sit down with their team members, (discuss) and design the work. For the presentation, I request that the students present their work in English.*

[RPICEEHMDerick]

It is evident that the teaching and learning in engineering courses supports the development of English language abilities in terms of expressing their opinions through discussions and delivering their ideas through presentations. Despite the platform for improvement provided, there is no guarantee that the interactions between the lecturers and students in discussing their projects is in English.

*But (discussing their projects), I usually interact in Malay with them, especially when they seem lost. Not many of the Malays interact with me in English. Most non-Malays interact with me in English.*

[RPIEEEHMRazak]

There is no guarantee that English is used in the interactions among the students when discussing their projects and preparing for their presentations.

*I'm not there when they do their discussion. I believe that before they do their presentations they must have some kind of rehearsal, but I have no control if they discuss among themselves in English.*

[RPICEEHMDerick]

Although they are encouraged to interact in English, students have the freedom to use any language they are comfortable with when conducting their discussions, particularly outside the classrooms.

*I don't monitor their discussions. That means they can use other language. Only the proposal and the presentation will be in English.*

[RPIEEHMAmin]

The findings show that while students are expected to use English for the end product, students have the autonomy to choose the language that they are comfortable with to conduct discussions. As language is not part of the assessment in engineering courses, students have the freedom to resort to using their mother tongue. Derick and Razak do not see the need for grading the students' language abilities as long as the content can be delivered.

*I'm not really grading their English. I want them to at least try to present in English. So I don't penalise if they have bad English. After all, I'm not teaching language, I'm teaching engineering.*

[RPICEEHMDerick]

At this juncture, Derick portrays himself as an educator who provides opportunities for the students to use English but not as someone who would assess students' development in the language. In other words, students' competencies in engineering and in English language are two separate components. As he is an engineering lecturer, it is not his responsibility to monitor students' ability in the language. This is similar to Razak's perception who will only look for keywords and will disregard the language ability when grading the students' assignments.

*Marking for the quiz is based on the method and the formula. I will normally look for keywords in their answers. If the keywords are available, I will still give marks even though their English is bad.*

[RPIEEHMRazak]

As argued by Baldauf (2012), the implementation of EMI is not only about teaching the content using English but also about the pedagogy of language teaching and learning. This suggests that engineering lecturers may also need to consider assessing students' language apart from the content. Based on the findings above, it could be seen that while the teaching and learning in engineering classrooms may provide the space for the use of English, considerations on how English language should be taught is limited. Baldauf (2012) on the other hand, suggests that engineering lecturers need to monitor their students' progress in the English language. The engineering lecturers may not have the expertise in English language teaching. This raises questions on how EMI can support both the acquisition of engineering knowledge and development of English language abilities. This calls for the need to conduct collaborative teaching and learning between engineering and English educators.



*I consider language as part of the assessment. Some of them, pronunciation is very good. Some of them is very bad. It is not in the rubrics but language affects the students' presentation marks.*

[RPIEEEHM01]

Apart from the presentations and discussions, the students are also required to write project reports. In some courses where problem-based learning was implemented, the students are required to write reports of their meetings.

*They need to write reports. But what I can detect is they still lack the basic grammar. For example they tend to mix up between active and passive voice.*

[RPIEEEHMAmin]

*Their technical writing is weak. They get mixed up with their tenses and their active and passive voice.*

[RPIEEEHMRazak]

This is another space available in engineering education for students to develop their English language abilities. However, students' limited proficiency in writing in English, are not addressed within this space as engineering lecturers only focused on engineering content. Amin stated that it is not possible to assess students' English language performance as most of them tend to copy and paste information that they need from the original source.

One of the English courses offered at this university exposed students to writing reports. It addresses issues such as language used in reports and paraphrasing to avoid plagiarism. The findings raise questions about how much students understand the content of the course and how students relate or apply the knowledge and skills from English language courses into their engineering courses.

### **The Role of English Language in Engineering Workplace**

All the lecturer respondents agree that the use of English in engineering education is important as all the references and the terminologies are in English.

*In engineering, whether they like it or not, they have to speak English well...How can you convince your clients if you can't speak English well? I always remind the students that.*

[RPICEEHMDerick]

English is widely used in engineering workplace. Thus, students would have to learn and use the language regardless of what their attitude towards the language is.

*I think nowadays English and Malay are very important...but when you go to Singapore you have to speak English. You cannot (avoid it)...In engineering it's a must.*

[RPICEEHMDerick]

Both Malay and English are important within Malaysian context. However, English needs to be given more emphasis in engineering education, as the language is important particularly within international contexts. In this case, the importance of English is determined by the context, local or international. For another lecturer, he experienced a different situation.

*In terms of communication with the personnel from the industry (for research), Malay is largely used. We feel more comfortable speaking in Malay.*

[RPICEEHMRazak]

The telecommunication companies which the respondent collaborated for his research are based in Malaysia. The personnel are mostly Malays and the medium of interaction between the respondent and his collaborators in these telecommunication companies is largely in Malay. However, there is one company that he interacts in English. The moderator of this company is a non-Malay who prefers to interact in English. This may indicate that the use of English in engineering business interaction may depend on the ethnicity of the personnel of a company. A Chinese business client for instance would naturally initiate interaction in English as English may be a 'comfortable' language to use. This indicates the role of English as an international working language for engineers when the business interaction contexts are with non-Malay speaking partners.

The findings in this section show that the use of English as the medium of interaction at workplace within Malaysian context is, to a certain extent, appears less consistent. When an organisation consists of personnel of multiracial, English can be a common medium of interaction. However, when an organisation is dominant of a particular race, the mother tongue is preferred over English.

## 5.0 CONCLUSION

Based on the findings above, it could be observed that the engineering lecturers support the development of English language and have positioned English language teaching as playing a significant role in engineering education. Despite opportunities given to the students in using English, the role of the language is merely as a medium and has no significant function in terms of the accuracy of the language as long as the information is conveyed. In other words, the engineering content and the English language are viewed as two different components. This raises questions on how the acquisition of the engineering content and the development of English language abilities can occur simultaneously in making learning of both aspects meaningful. This calls for an ecosystem which can support, not only the development of students' English language abilities, but also the involvement of an institutional effort to boost a continuous usage of the language within the university community.

One of the ways to contribute towards this ecosystem is to develop a collaborative teaching and learning between the English language educators and engineering lecturers. This could provide a platform for engineering students to develop and enhance their English language abilities within the engineering education. The findings in the previous section have highlighted two key issues that needs to be considered for this collaboration to be effective and meaningful.

Firstly, the engineering lecturers had some understanding of the role of English language courses in engineering education. Nonetheless, the development and the enhancement of the English language performance should be dealt with in the English language classrooms. Both the English language educators and the engineering lecturers need to understand the language needs of the engineering students and their roles in addressing these language needs. In addition, they need to develop appropriate learning outcomes that could enhance students' knowledge and skills in engineering, as well as their English language abilities. According to Richards (2018), in order to develop effective learning outcomes of a

language course, English language educators need to precisely identify the knowledge and skills that students should have acquired at the end of the course. Taking this into consideration, both the English language educators and engineering lecturers need to synchronise their learning outcomes and determine the knowledge and skills that need to be addressed by them respectively.

Secondly, despite providing the space for using English language, the engineering lecturers did not believe that students' English language performance should be measured in engineering classrooms. English language was merely a medium for delivering the content knowledge and should be assessed separately through the English language course assignments. This suggests that there is lack of support from the engineering lecturers in developing the ecosystem. Thus, to what extent knowledge transfer occurred from English language classrooms into engineering contexts could not be determined. Nonetheless, language plays an important role in disseminating information and therefore, should not be segregated from the content. In the context of English in engineering education, the language is more specialised, different from that of general proficiency. According to Woodrow (2018), specialised language focuses more on communicative situations such as giving oral presentations. Based on the findings, some of the activities conducted by the engineering lecturers included oral presentations, group discussions and report writing. With these activities, English language educators could provide support in terms of teaching the language use for oral presentations or meetings. In addition, the English language educators could also assist with the assessment of these activities.

This research has highlighted the the key elements that could contribute towards developing an ecosystem to enhance the English language abilities of engineering students. The data collected were based on the participants' perceptions and reflection of how they conduct their class using English as the medium of instruction. Further investigation is required to examine their teaching practices in the classroom to provide insights into the complexity of developing the ecosystem to support students' English language learning.

The importance of English language in engineering, academically and professionally is unquestionable. In an English as a second language context, such as Malaysia, creating an ecosystem is crucial to provide continuous opportunities for students to practise the language. One of the ways of contributing to this ecosystem is the implementation of collaborative teaching and learning between English language educators and engineering lecturers. Nonetheless, this collaboration needs to be thoroughly discussed and structured to ensure that the collaboration is successful and able to address the engineering students' language needs. The learning outcomes of both disciplines need to be synchronised and the assessments need to be well-designed so that the collaboration can be effective and meaningful, contributing to the success of the ecosystem.

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