The Impact of English on students performance based on Neural Network Prediction: A Malaysian Case Study

PAUZIAH MOHD ARSAD¹, NORLIDA BUNYAMIN¹, JAMALUL-LAIL AB MANAN²

¹Engineering and Technical Education Research Group, Faculty of Electrical Engineering, Universiti Teknologi MARA, Shah Alam Selangor, MALAYSIA
²Strategic Advanced Research Cluster, MIMOS Berhad, MALAYSIA

Abstract: – English has been used widely as a medium of instruction in the science and technology courses in Institutes of Higher learning in Malaysia. Besides the engineering courses, two other courses are specially designed to help students in English Proficiency in the universities. This paper investigates a Neural Network (NN) model to predict students’ academic performance of Electrical Engineering Degree at the Faculty of Electrical Engineering, Universiti Teknologi MARA (UiTM), Malaysia. The study was conducted on intakes from Matriculation who have to complete the entire program within eight semesters. The performance was measured based on their Cumulative Grade Point Average (CGPA) upon graduation. This paper particularly focuses on the determination of parameters as input variables for the model using Artificial Neural Network (ANN) as the prediction tool, the students’ results for fundamental subjects at third semester are used as predictor variables (initial values) for predicting the expected (projected) final CGPA upon graduation. We further extended the model to also include English Language courses with the intention to see the effect on students’ final performance. The outcomes of the study indicated that there appears to be a direct correlation between students’ results for fundamental subjects and the final overall academic performance of graduating students, irrespective of their gender. As expected and in line with previous works by other researchers, the English Language courses had little effects on the performance (final CGPA) but it will help students during interview session.

Keywords: English, Academic performance, prediction, engineering fundamentals, Medium of instruction

1 Introduction

Malaysia, then known as Malaya was one of the British colonial countries that achieved independence in August 1957 as a Federation of Malaya. Later in 1963 a new union was formed with Sabah, Sarawak and Singapore joining the Federation. Singapore later opted to be independent two years later in 1965. Since then Malaysia kept English as the official language while Malay Language became the national language until 1970 whereby English became the second language.

There was no Professional engineering courses available in Malaysia then except in the University of Malaya which was the first Malaysian university to offer a degree in Engineering in 1958. English has been used as the medium of instruction in business and science courses at University of Malaya then.}

Many years later in 2009, Malaysia has 20 public Institutes of Higher Learnings (IHL) and 536 private IHLs that offered professional courses at Diploma, Degree and post graduate levels. [1] Many of these IHLs had taken Malay as the medium of instruction. As years went by and in response to globalization, Malaysia opted English as the medium of instruction in science and technology based courses in IHLs. This is in tandem with the Wawasan 2020 (translated as Vision 2020) launched in 1992 by the Prime Minister of Malaysia which set its goal to become a developed country in 2020. In this vision, Malaysia shall develop in all aspects such as economy, political, social, spiritual, psychological and cultural. English has been stated clearly as the medium of instruction in all IHLs to meet the global challenges.[2]

The significance of English Language is highly emphasized. English has become the medium of
communication among international business and technology based tradings, and thus its proficiency is highly appreciated and sought for in IHLs among many countries in the world. However the adoption of English as the trading language is much influenced by the policy makers of each individual country.

On the other hand C. Hengsadeekul [3] pointed out that in Thailand, English Language is mainly used for the purpose of academic or career advancement, particularly for travelling abroad as well as for economic success. They found that it is very difficult for Thai students to improve English proficiency due to the fact that medium of instruction in classroom is mostly Thai. They found that English teachers were mostly non-native English speakers that unfortunately created non genuine interaction of the English language in classrooms among students. According the their survey, they found that Thai learners had low English proficiency relatively when compared with other developing countries like Malaysia, Singapore and Phillipines. Good proficiency of English depends on many factors including student’s interest and perception of its importance, influence of mother tongue language and also effective methods of delivery [4-6].

2 Bachelor of Electrical Engineering Degree Program UiTM Malaysia

Universiti Teknologi MARA (UiTM) is one of the public IHLs that offers Bachelor of Engineering courses. Apart from Electrical, we have Civil, Mechanical and Chemical under the Science and Technology based discipline. On top of that we have Faculties of Medicine, Pharmacy, Allied Health and Dentistry that sit under the Discipline of Science and Technology based group.[7]

Faculty of Electrical Engineering started with Advanced Diploma in 1968 and then became a two-tier program in1976 with the introduction of Diploma Programme. Students undergo three (3) years of Diploma after O level examination followed by another two and half (2 1/2) years of Advanced Diploma Programme. The Advanced Diploma was renamed as Bachelor of Engineering (Honours) Electrical in 1996. The advantage of such two-tier program is that Students with Diploma certificate have the choice of joining the workforce as assistant engineer or to continue further studies to a degree level as full time or off campus student.

English has been used as the medium of instruction in all courses right from semester one until the final semester eight. The Matriculation students spend 4 years or eight semesters while the Diploma students spend three years or six semesters to complete the entire programme. The diploma students are given credit exemptions for courses in semester one and two upon acceptance into the Programme. On average a student takes fifteen to seventeen credit hours per semester and they have to complete a total of 137 credit hours with at least CGPA of 2.0 to be conferred a Bachelor Degree. The Electrical Engineering courses include basic Fundamenals of Electrical Engineering, Mathematics for Engineers, Machines, Power Electronics, Communication, Computer architecture, Advanced Electronics, Control System and Instrumentation. On top of that, Report writing and English Communication skills are introduced to help students to master English proficiency before graduation. Report writing is introduced at semester three while Communication skills is done at semester eight. As an added value to students in UiTM, a third language is offered apart from English. The languages offered include Mandarin, German, French, Arabic and Korea. Each student must complete three levels of their chosen third language before completion of the degree programme. [8]

3 Methodology

The methodology used in this study is to develop a Neural Network (NN) to predict students CGPA at semester eight upon
graduation (denoted as CGPA8 in this paper). We have been fortunate that we were given permission to have access to the faculty’s students historical database. For the purpose of our study, data were compiled based on past three generations of matriculation students coming from July 2005, 2006 and 2007. A total of 391 students became samples for our research work, i.e. we followed through each of these students for every semester until graduation. NN was used to predict future events based on past historical data. We chose NN because it has been widely used for prediction purposes in banking, aerospace, military, automotive industries, financial market. We decided that we could also use NN in academic sector to predict students performance. [9-11]

Fig. 1 below shows our initial simple model which consists of NN with input, hidden layers and output. In NN, the number of layers chosen would depend on the designer and it is really a trial and error process of choosing the best value of Learning Rate and Momentum Rate for any particular model developed.

![Fig. 1 Neural Network model](image)

In this work, the NN model takes input parameters as Grade Points scored by individual students in fundamental subjects at semester one, and we could use the NN predictor to predict the performance of the student upon graduation. Hypothetically, we would expect that these fundamental subjects would have a strong influence on the students performance because the subjects are indeed the foundation or pre-requisite to higher or more difficult subjects later in the degree program. We have proven this hypothesis in our previous work, whereby it was found that there is indeed a strong correlation between those selected subjects with the predicted performance in the final semester i.e. CGPA8. [12]

In this paper, we again use the same model but with an additional test data i.e. English1- Report Writing, at semester three. Then the model was again tested with additional two subjects i.e. English1 and English2 (Communication & Interpersonal Skill). Our intention is to see the effect of these additional English Language subjects on the students performance upon graduation.

In summary, we have focussed on the following in our research work:

i. The input predictor variables

ii. The architecture of NN model

iii. The impact of English courses on students performance.

4 Findings

The NN predictor model for predicting students performance which we have developed is shown in Table 1.0 below, where 70% of data was used for training and 30% for testing. We chose two hidden layers with one output. The inputs consists of Grade Points of core subjects (including English1 and English2) taken by individual students at semester three. The learning rate and momentum rate are also shown in the table. The transfer technique used was Lavenberg Marquatt (LM). The coefficient of Correlation R with highest value is of good performance and Minimum Squared Error (MSE) will determine the end of simulation training of NN. The input were Grade Points of core subjects taken by students at semester three from a total of eight semesters before graduation. Table 2.0 shows the NN configuration of the model developed.
From the Table 2.0 it can be seen that the Coefficient of Correlation, $R$ is 0.92256 (with English or model A) and 0.92545 (without English or model B). The Mean squared error is 0.04375 (model A) and 0.07969 (model B). There is not much difference in the values of $R$ in both cases but there is a small increase in MSE in model B. The best model is the one with highest $R$ and minimum MSE. As in the previous study NN gives smaller MSE with more input parameters variables. [12]

Fig.1 and Fig.2 below shows the comparison between Targeted and Predicted output based on tested data. As can be seen from both graph outputs, at low CGPA8, the predicted value is higher than the targeted or actual value. On the other hand those students at higher CGPA8, the predicted is lower than the targeted value. This was confirmed in earlier study of prediction whereby it is extremely difficult to maintain CGPA as students move to higher semester due to the increase in the total hours accumulated to achieve the overall CGPA.
From the graphs, it can be seen that the English courses did not influence much on the overall performance of the Degree Students. The graphs also further strengthen our earlier findings that the strong ability of students on fundamental subjects have greatly influenced the students’ performance upon graduation. To confirm the findings, we tried putting solely English Language courses as the input variables to our developed model (Model C). The resulting output shows that the Coefficient of Correlation obtained was 0.5221 while the MSE obtained was 0.1174. The value of R was very small indeed and normally accepted value of R is 80% and above for good correlation exercises. Fig. 3 depicts the poor correlation of English courses for the Tested Data.

**Fig. 1** Comparison between Targeted and Predicted for 6 Inputs (model A)

**Fig. 2** Comparison Between Targeted and predicted 4 Inputs without English (model B).

**Fig. 3** Comparison between Targeted and Predicted using English courses only (Model C)

### 5 Conclusion

This paper presents our work on the impact of English courses on students performance using our NN-based Student Performance Prediction Model. We have taken the students data mainly from Bachelor Degree students from UiTM. Using our model, it can be concluded that those students with strong fundamental or core courses at the beginning of their program will maintain and perform better upon graduation. We have shown that English Language courses did not have much impact on the student performance upon graduation. However, we believe that the students with good English Language proficiency would certainly be at an extra mileage against others especially during interview sessions. Though CGPA has been used by many employers as a criterion or basis for inviting graduates for the first round of interview, other traits like effective communication, interpersonal skills, leadership and entreprenueral skill are also required for the final decision. In this situation, a good command of English is of dire importance, alongside with...
strong foundation in engineering courses right from the very beginning of any Electrical Programme. Lastly, we believe that our NN-based Predictor Model would be very useful in helping the university management in putting up a good strategy to intervene so that students’ performance can be further elevated.

References:


