PalArch's Journal of Archaeology of Egypt / Egyptology

DEVELOPMENT GUIDELINES FOR AN ARTIFICIAL INTELLIGENCE ALGORITHMIC MODEL IN TEACHING FOREIGN LANGUAGES TO THAI STUDENTS

Chakrit Visaltanachoti[1], Chantana Viriyavejakul[2], Thanin Ratanaolarn[3]

[1,2,3] King Mongkut's Institute of Technology Ladkrabang (KMITL)

E.mail: [1]chakritv@yahoo.com , [2] chantana.vi@kmitl.ac.th , [3] thanin.ra@kmitl.ac.th

Chakrit Visaltanachoti, Chantana Viriyavejakul, Thanin Ratanaolarn. Development Guidelines For An Artificial Intelligence Algorithmic Model In Teaching Foreign Languages To Thai Students-- Palarch's Journal Of Archaeology Of Egypt/Egyptology 18(18), 371-380. ISSN 1567-214x

Keywords: Artificial Intelligence Technology, Algorithm System, Foreign Languages, Natural Language Processing, Thailand

ABSTRACT

Ukrainian Unicorn company Grammarly currently valued at over $1 billion. Therefore, this study entails an expert analysis review of the proposed artificial intelligence (AI) algorithmic technology model for teaching foreign languages to Thai students. We created an interview from an extensive review of the literature and brought it to three experts who examined the quality of the research and the model. This assessment process used the item objective congruence (IOC) index, which was calculated as 0.79. After that, non-probability sampling was used to select seven experts for an exploratory investigation into the use of AI for English language teaching. Purposive sampling was used from this group to identify three experts who were executives in technology firms related to AI and algorithm development and four educational professionals who served as English department headteachers. The researchers then used a set of requirements that were further separated into four categories: 1) AI technology algorithms need the precision that can distinguish speech, 2) AI technology algorithms must have correct syntax, dialogue, and vocabulary; 3) the AI technology algorithm system must have an explanation of the syntax, and 4) the AI technology algorithm system must emphasize clear and fluent English-speaking pronunciation.

INTRODUCTION

English is considered a second language to many globally and plays an essential role in a broader level of communication at the international level. Moreover, being proficient in English can be crucial in studying abroad or at an international institute in Thailand. Many believe that English proficiency can open employment opportunities in international sectors ranging from aviation to tourism to foreign trade. Furthermore, English language proficiency can open

doors to scholarships and advanced studies for many students due to English being considered the language of business and academics.

English can also be beneficial when traveling in foreign countries and help manage and deal with most situations in non-English-speaking countries such as Thailand, Japan, China, and Korea. This is because international travelers will always find someone involved in the hospitality and accommodation sector or international travel sector who can communicate in English. However, despite its worldwide fame as a tourist destination and the requirement for English language education starting in primary school ‘s Grade 1 through Grade 12 in secondary school (Ministry of Education, 2008; Prasongporn, n/d), test scores in Thailand reveal the questionable methods being employed (Noom-ura, 2013). An example of this can be found in an EF Education report from 2020 in which English language scores were reported to drop for a third consecutive year to 419 out of a possible 800 ("English skills drop again," 2020). On the company's rating scale, a score of 417 is considered 'very low,' which was additionally 89th on the list of 100 countries surveyed. Added to these woes is a highly controversial English teaching model used in Thailand, in which classes focus on grammar, translation, and memorization rather than real-life communications. Once again, numerous studies have pointed out this discouraging undertaking with the usual outcome of skills and scores at the bottom of most assessments (Kaur et al., 2016; Thadphoothon, 2017). Therefore, the problems of teaching and learning English in Thailand can be summarized in various studies and reports as follows:

In terms of teaching and learning, it has been found that the teaching and learning of English were not yet integrated into all four skills, and practice was not sufficient. Once again, there is a heavy emphasis on teaching grammar and vocabulary, which, as a result, learners are unable to communicate in English. In addition, even when the effort and expense are undertaken to hire foreign English teachers (both native and non-native speakers), many Thai families cannot afford the extra expense of these special programs. Additionally, the teaching and learning methods are not diverse and do not correspond to the students' fundamentals.

Furthermore, English class sizes become large and difficult to manage, with the resultant outcome producing learners who have little or no time in actual communicative dialogues. There are also significant issues with the assignment of English language teachers who have little to no training in their assigned discipline. Studies show that most Thai teachers rated their English performance as low (Thadphoothon, 2017).

Moreover, in researchers' deeper examinations of Thai English language classes, several problematic themes continue to occur. These include poorly trained and unqualified teachers, poor student motivation, mixed-ability learners, classrooms with too many students, and rare student opportunities for English language exposure outside of the classroom (Dhanasobhon, 2006; Noom-ura, 2013; ONEC, 2003).

MORPHOLOGICAL OVERVIEW

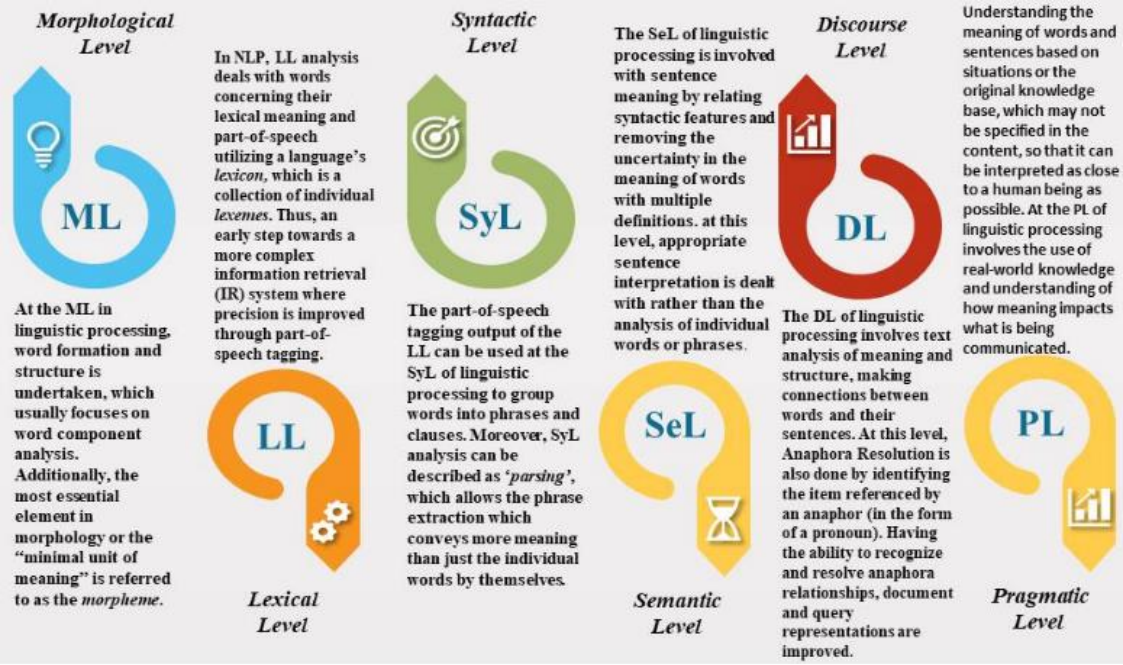
Artificial intelligence (AI) is a technology that can emulate humans or intelligent machines in terms of ideas analysis or the impersonation of human behavior or speech. To do this, software programs are created in which instructions are embedded into a device, from which instructions and responses can be obtained. To make an intelligent mechanical system or device able to communicate with humans using Thai, English, or any other language, AI can translate the meaning of the words humans speak to match the desired language. Additionally, intelligent machines can also make devices with embedded AI technology that can have a human-like thinking process that can help analyze and make decisions on various pieces of information by themselves.

The commercial viability of AI in education is expanding rapidly, with AI investment rising from an estimated $500 million in 2019 to an estimated $6 billion by 2024 (Mwiti, 2019). Commercial applications in language learning and grammar assessment can be found on platforms such as the Ukrainian startup Grammarly (Fitria, 2021), whose estimated value in 2019 was more than $1 billion, making it an official startup unicorn. Furthermore, natural language processing (NLP) has been defined as a range of computational techniques used to analyze and represent naturally occurring texts at one or more levels of linguistic analysis (Liddy, 2001). Moreover, according to Jackson and Moulinier (2012), NLP describes how software and hardware synthesize and analyze written or spoken language. Five significant areas have been identified since the introduction of NLP. These include natural language comprehension, natural language creation, voice and speech recognition, machine translation, and grammar checking and spelling correction (Church & Rau, 1995). This is consistent with Kurdi (2018), who described NLP as a scientific discipline found at AI, cognitive psychology, and linguistics intersections.

Moreover, various scholars have commented on NLP roots, including psychology, electrical and electronic engineering, computer and information sciences, linguistics, mathematics, AI, and robotics (Joseph et al., 2016). In addition, applications used in NLP come from various fields, including natural language text processing and summarization, machine translation, user interfaces, multilingual and cross-language IR, speech recognition, AI, and expert systems (Jusoh & Alfawareh, 2007; Ringger ET AL., 2004).

Finally, according to Español (2017), NLP can work at multiple levels, and frequently, these different areas synergize well with each other and are helpful in IR. The entire six-level language-learning process is summarized in Figure 1. In addition to understanding each point, the NLP offers four other language learning channels modeled on human language learning. These are symbolic, which is the basis of human language comprehension by using AI to understand vocabulary. The second is statistical, which is the creation of machine-learning algorithms for language processing. The statistical NLP learns the basics of language. Then, AI is used to collect language usage data from which the model is analyzed by statistical methods, such as viewing the frequency of words using standard sentence sequencing methods, and new knowledge is synthesized. This helps AI improve language based on its current popularity.

Figure 1. Six levels of language learning processes.



Sources: (Español, 2017; Oz, 2014) Template credit: www.presentationgo.com
This process also helps in AI use in understanding the use of language in specialized fields such as finance, science, and academic papers. Third, a mobile application is an application that helps users operate on portable communication devices such as mobile phones. These applications use different operating systems (OSs). Harris (1974) divided speech into five areas: vocabulary, grammar, fluency, pronunciation, and comprehension. Finally, neural NLP has become essential for electronic health records and doctors' note-taking (Turchin et al., 2021).

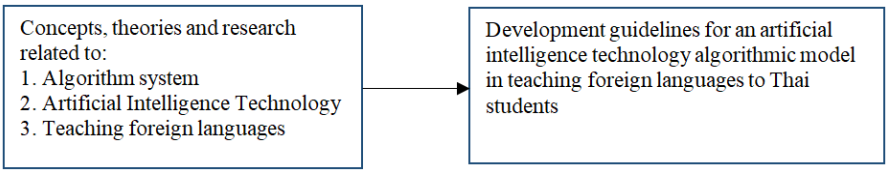
SIGNIFICANCE OF THE STUDY

One goal of AI is to create programs that can understand the human language. It is understandable to communicate the natural language, which appears to show human intelligence, but also creates success in enhancing one's abilities while optimizing the PC for the task.

STUDY OBJECTIVES

The study set out guidelines for developing an AI technology algorithmic model for teaching foreign languages to Thai students (Figure 2).

Figure 2. Research framework.



METHODS

Population and Sample

Initially, the researchers used non-probability sampling to find experts that would be used for an exploratory investigation into the use of AI for English language teaching. Purposive sampling was used from this group to identify three experts who were executives in technology firms related to AI and algorithm development and four educational professionals who served as English department headteachers. Interviews with each of the seven experts were conducted using the Microsoft Teams conference program.

Data Analysis

Table 1 shows the outcome of analyzing the correlation of words and keywords to develop an AI technology algorithmic model in teaching foreign languages to Thai students.

Table 1: Analysis of the correlation of requirements and categories for developing an AI Technology Algorithmic Model in teaching foreign languages to Thai students.

Requirements	**Category**
1. AI is used to record sound, images, and voice patterns to analyze the learners' voices by identifying speech sounds. 2. Various user digital and audio devices will be used to collect and develop AI technology to develop speech recognition, processing, and synthesis systems. 3. Even though most Thai workers and students still give significant importance to the use of English (especially grammar), a limiting factor is their fear of speaking. Moreover, problems are compounded by their fear of speaking with foreigners due to their inability to pronounce correctly. Therefore, personal and accurate AI systems can help improve personal English skills and correct pronunciation. 4. AI technology must differentiate the differences in sound and tone when English and Thai are used. 5. AI technology adoption must distinguish speech and emphasize the skills of pronouncing correct, clear, precise, and phonemic levels that help individuals improve their spoken English. 6. Development of AI technology must be able to distinguish speech at the phonemic level while helping to improve users' English speaking skills.	1. AI technology algorithms need the precision that can distinguish speech.

1. Development of AI technology must be focused on correct pronunciation, word and sentence structure, and dialogue. 2. Development of AI technology must be capable of answering user queries accurately. It must also read dialogue, undertake storytelling, and use narrative and straightforward language appropriate for the Thai language and culture. 3. Development of AI technology must provide authentic and accurate knowledge of English based on the principles of dialogue, vocabulary, and sentence patterns. 4. Development of AI technology must be able to pronounce words and sentences correctly, using correct word accent, stress, and pitch in the context of the meaning.	2. AI technology algorithms must have correct syntax, dialogue, and vocabulary.
1. The AI technology algorithm system must interpret English from users who are not well versed in English grammar structure. AI system policies must not lead to even greater confusion. 2. The AI technology algorithm system must clarify confusion and solve speech and writing grammar mistakes and confusion or doubts about choosing tenses. 3. The AI technology algorithm system must be developed with grammar at its core with an errorless ability to use English in listening, speaking, reading, and writing communication.	3. The AI technology algorithm system must have an explanation of the syntax.
1. The AI technology algorithm system must be able to emulate proper stress and tone. 2. The AI technology algorithm system must improve the user's English-speaking skills by making them transparent, fluent, and confident. 3. The AI technology algorithm system must accurately re-produce word sound correctly so students can practice speaking English in a fluent and comprehensible manner.	4. The AI technology algorithm system must emphasize clear and fluent English speaking pronunciation.

DISCUSSION

Much of the analysis in Table 1 is consistent with Smadi et al.'s (2015) research. From the authors' research, speech recognition or speech to text was stated to include multiple elements. These included capturing and digitizing sound waves, transforming basic linguistic units or phonemes, constructing words from phonemes, and contextually analyzing the phrases to ensure a correct word spelling that sounds the same. The research team of Stocked et al. (2000) also developed a conversational model using a statistical approach in which conversation detection and prediction were based on verbal, co-locational, and prosodic cues and the discourse coherence of the dialogue act sequence.

Moreover, although unreliable in the past, English language grammar checkers have made significant improvements in their accuracy due to advances in NLP (Madi & Al-Khalifa, 2018). There have also been improvements in AI,

linguistics, and computer science subfield convergences about human-machine natural language interaction. An excellent 'real-world' example of AI's use in commercial applications for English language use is the English writing assistant 'Grammarly' (Fitria, 2021). Moreover, Mammadova (2019) added that online grammar and spelling checkers play an essential role in teaching English and learning. Joseph et al. (2016) also added that NLP effectively analyzes text using automated means, involving gathering information concerning how humans understand and use language.

Further support for AI's increasing role in English writing can be found in a study by Tonic (2020). The author stated that AI's recent advances in machine learning deep neural networks had engendered a revolutionary way for people to write in which they can craft compositions augmented by algorithmic grammar checkers correcting writing in real-time (such as with Grammarly).

This is consistent with research from Goldberg (2016), who stated that developments in deep neural network learning have led to more robust and precise grammar checking systems. Kurdi (2017) added that today's NLP applications focus on machine translation (MT), IR, big data, and information extraction. Borges (2016) also indicated the potential importance of AI applications in analyzing and producing results for better student evaluation processes at both the university and pre-university levels. AI also makes it easy for instructors to precisely measure their students' levels, which is often difficult to achieve (Mwiti, 2019). It also allows teachers to determine the educational processor levels and deficiencies in their scientific content, lectures, and educational material.

AI can also help meet the needs of each student according to their abilities. This includes introducing home assignments and scoring monitoring obtained from each student. Thus, these intelligent programs can identify the students' common mistakes, give the instructors hints about the problems, and introduce instant feedback in a separate file for each student. Furthermore, McAteer (2002) conducted a detailed analysis of spoken dialogue systems and stated that using natural spoken language allows users to interact with computer-based applications such as databases and expert systems. The results agree with the results of Al-Far and Shahin (2019) regarding the effectiveness of intelligent applications in clear teaching and learning, especially in abstract processes. However, Al Mukhallafi (2020) pointed out the deficient level of employment of AI strategies for teaching English in Saudi Arabia.

CONCLUSION

The authors identified what guidelines are required to develop an AI technology algorithmic model to teach foreign languages to Thai students. A literature review determined that several factors inhibited Thailand's English education process, which resulted in low scores. These included poorly trained and unqualified teachers, poor student motivation, mixed ability learners, classrooms with too many students, and rare student exposure to English outside of class time. As a result, many learners cannot use English as an effective communication tool. Therefore, the need for AI-based learning tools is paramount. Moreover, we identified five essential components of an AI

technology algorithmic model for teaching foreign languages to Thai students. These were:

1. The need for speech recognition accuracy refers to the AI algorithm's ability to distinguish speech and process what is heard. There must also be noise isolation capability from the environment and the ability to differentiate sounds and distinguish various pronunciations of syllables, intensity, punctuation, rhythm, and rhyme. This also includes the ability to distinguish between specific sounds.
2. The AI algorithmic technology model also needs good accuracy in vocabulary, sentence patterns and dialogue, and sound detection. It must also be able to comprehend and hear long texts, including comprehension of words, sentences, and long conversations.

3. Within the proposed system, descriptive grammar refers to the algorithms of artificial intelligence technology that can create sentences and arrange words correctly according to the linguistic principles of direct meaning. Eight English word types must be recognized: nouns, pronouns, adjectives, verbs, adverbs, prepositions, conjunctions, and interjections.

4. The AI technology algorithmic also needs to tell the correct answer and clarify various problems.

5. Emphasis on the pronunciation of speaking English clearly and fluently means that AI algorithms can process the hearing of words ending in-tion, words ending in -ing, ending in -er/-or, words ending in-ment, as well as words ending in -ty -ry and is/was in a sentence.

Finally, the suggested approaches to the algorithmic development of artificial intelligence technology to help teach foreign languages to Thai students are as follows:

1. Accuracy that can distinguish speech.
2. It must have the correct vocabulary, sentence patterns, and dialogue.
3. Grammar must be explained.
4. There is an emphasis on pronunciation and clear and fluent spoken English.

RECOMMENDATIONS

An AI technology algorithm needs precision to distinguish speech.
An AI technology algorithm must have the correctness of vocabulary, syntax, and dialogue.
An AI technology algorithm must have an explanation of the syntax.
An AI technology algorithm must emphasize clear and fluent English-speaking pronunciations.

REFERENCES

Al Mukhallafi, T. R. (2020). Using artificial intelligence for developing English language teaching/learning: An analytical study from university students' perspective. International Journal of English Linguistics, 10(6), 40 - 53.

https://doi.org/ 10.5539/ijel.v10n6p40

Borges, N. (2016). White paper—Artificial Intelligence to improve education/learning challenges. International Journal of Advanced Engineering & Innovative Technology, 2(6), 10 − 13. https://tinyurl.com/78bac24h

Church, K. W., & Rau, L. F. (1995). Commercial applications of Natural Language Processing. Communication of the ACM, 38(11), 71 – 79. https://doi.org/10.1145/219717.219778

Dhanasobhon, S. (2006). English language teaching dilemma in Thailand. https://tinyurl.com/jpsvxbvv

English skills drop again. (2020, November 27). Bangkok Post. https://tinyurl.com/3nr22srb

Español, C. K. (2017), What are the different levels of NLP? How do these integrate with Information Retrieval? [Personal blog]. https://tinyurl.com/9cj9jj7c

Fitria, T. N. (2021). "Grammarly" as AI-powered English writing assistant: Students' alternative for English writing. Metathesis: Journal of English language literature and teaching, 5(1), 65 – 78. 10.31002/metathesis.v5i1.3519

Goldberg, Y. (2016). A primer on neural network models for natural language processing. Journal of Artificial Intelligence Research, 57, 345 - 420. https://tinyurl.com/uptumdy8

Harris, D. (1974). Testing English as a Second Language. McGraw Hill Book Company

Jackson, P., & Moulinier, I. (2012). Natural Language Processing for Online Applications. Cambridge University Press.

Joseph, S. R., Hlomani, H., Letsholo, K., Kaniwa, F., & Sedimo, K. (2016). Natural language processing: A review. International Journal of Research in Engineering and Applied Sciences, 6(3), 207 – 210. https://tinyurl.com/3r4baw

Jusoh, S., & Alfawareh, H. M. (2007). Natural language interface for online sales. In Proceedings of the International Conference on Intelligent and Advanced System (ICIAS2007), Malaysia: IEEE, November 2007, pp. 224 - 228.

Kaur, A., Young, D., Kirkpatrick, R. (2016). English education policy in Thailand: Why the poor results?. In Kirkpatrick R. (Ed.), English Language Education Policy in Asia. Language Policy, vol 11. Springer. https://doi.org/10.1007/978-3-319-22464-0_16

Kurdi, M. Z. (2017). Natural language processing and computational linguistics 2: Semantics, discourse, and applications (Vol. 2). John Wiley & Sons.

Liddy, E. D. (2001). Natural Language Processing. In Encyclopedia of Library and Information Science (2nd Ed.), Marcel Decker, Inc.

Madi, N., & Al-Khalifa, H. S. (2018). Grammatical error checking systems: A review of approaches and emerging directions. In 2018 Thirteenth International Conference on Digital Information Management (ICDIM) (pp. 142-147). IEEE.

https://doi.org/10.1109/ICDIM.2018.8847020

Madi, T., Al Issa, H., Trad, E. and Madi, K. (2015) Artificial Intelligence for Speech Recognition Based on Neural Networks. Journal of

Signal and Information Processing, 6, 66-72. https://doi.org/10.4236/jsip.2015.62006.

Mammadova, T. (2019). Teaching Grammar to a Grammar-Free Generation. Cambridge Scholars Publishing.

McAteer, M. F. (2002). Spoken dialogue technology: enabling the conversational user interface. ACM Computing Surveys, 34(1), 90 – 169.
https://doi.org/10.1145/505282.505285

Ministry of Education. (2008). The Basic Education Core Curriculum BE 2551 (AD 2008). https://tinyurl.com/3tewh24a

Mwiti, D. (2019, January 19). How artificial intelligence is shaping the future of education: Application of machine learning in education [Personal blog].
https://tinyurl.com/57a66jak

Noom-ura, S. (2013). English-teaching problems in Thailand and Thai teachers' professional development needs. English Language Teaching, 6(11), 139 – 147.
http://dx.doi.org/10.5539/elt.v6n11p139

ONEC. (2003). Education in Thailand 2002/2003. ONEC Publication.

Oz, H. (2014). Morphological awareness and some implications for English language teaching. Procedia - Social and Behavioral Sciences, 136, 98 – 103.
https://doi.org/10.1016/j.sbspro.2014.05.296

Prasongporn, P. (n/d). English education at primary level in Thailand. Monograph.
https://tinyurl.com/7pzynbzt

Ringger, E. K. Moore, R. C. Charniak, E. Vanderwende, L. & Suzuki, H. (2004). Using the Penn Treebank to Evaluate Non-Treebank Parsers. In Proceedings of the 2004 Language Resources and Evaluation Conference (LREC), 2004, Lisbon, Portugal.

Smadi, T., Al Issa, H., Trad, E., & Smadi, K. (2015). Artificial intelligence for speech recognition based on neural networks. Journal of Signal and Information Processing,
6(2), 66 - 72. https://doi.org/10.4236/jsip.2015.62006

Stocked, A., Rise, K., Cuccaro, N., Sheinberg, E., Bates, R., Jurafsky, D., Taylor, P., Martin, R., Van Essa-Dykema, C., & Meter, M. (2000). Dialogue act modeling for automatic tagging and recognition of conversational speech. Computational Linguistics, 26(3), 1
– 34. https://arxiv.org/abs/cs/0006023

Thadphoothon, J. (2017). English language competence of Thai school teachers. In International Conference on Economics and Management Innovations (ICEMI).
https://doi.org/10.26480/icemi.01.2017.154.156

Tonic, J. C. (2020). Preparing tomorrow's leaders for yesterday: AI and standardized grammar. New Jersey English Journal, 9, Article 16. https://tinyurl.com/wwvvant9

Turchin, A., & Builes, L. F. F. (2021). Using natural language processing to measure and improve quality of diabetes care: A systematic review. Journal of Diabetes Science and Technology, 15 (3), 553 – 560.
https://doi.org/10.1177/19322968211000831