

Artificial Intelligence Education (AIEd) in English as a Second Language (ESL) Classroom in Sri Lanka

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Abstract— Artificial intelligence (AI) is demonstrated by machines, in contrast to the natural intelligence (NI) displayed by humans and other animals. Artificial Intelligence Education (AIEd) is defined as the use of Artificial intelligence in the field of education. At present, a multitude of AIEd-driven applications are already in use in schools and universities. However, it has never been tested in Sri Lanka. The current situation of the ESL teachers in Sri Lanka includes: having students more than 40, a class with a range of proficiency levels as they were not classified according to their levels, having a majority of the students with lower-proficiency levels with few intermediate students, lesson plan developing to match the proficiency levels of every student in the class, inconsistency in attendance, limited time period of teaching and assessing and numerous documentation during the assessing process. This particular study investigates the different possibilities of having AI employed in the ESL classroom to increase the student experience and productivity of the teaching process, and develop a concept as how to use AI in the Sri Lankan ESL classroom. The concept under discussion is capable of saving time and energy wasted in the traditional ESL classroom and allocates them solely for teaching and learning purpose. It deviates from the lecturing method and provides a self-learning approach to the ESL learner. Since the students have access to personalized lessons, to view their development records and their frequent errors, to communicate with teacher and others when they need clarifications and to learn the lesson at home, if they were absent, the AIEd would provide an active and interesting learning environment. However, to initiate this AIEd approach, both ESL teachers and learners should have a sound knowledge in handling a computer, the classes should have computers for all the students with internet connection, and there should be experts to maintain the AIEd system.

Keywords- Artificial Intelligence Education, ESL classroom, Teaching, Learning

I. INTRODUCTION

Artificial is the intelligence shown by machines, whereas natural intelligence (NI) displayed by humans and other animals. Any device that perceives its environment and takes actions that maximize its chance of successfully achieving its

goals is attributed to have Artificial Intelligence. As a whole, if a machine can initiate the cognitive functions of a human mind such as learning, communicating and problem solving, it is known as Artificial Intelligence. The specialized areas of AI differ according to requirements. Natural Language processing skills of AI is significant in machine translation and communication, meanwhile, object recognition is important when developing automated vehicles, and similarly, problem-solving skills are essential when developing applications. Thus, different areas of AI can be developed to cater to various aspects of human life. Recent developments have focused on using AI in Education to simplify classroom management and increase the productivity of teaching. As far as the Sri Lankan scenario in English as second language classroom is concerned, a typical class contains more than twenty students who are in different proficiency levels. The teacher is required to cater to all language needs of the students while keeping constant records on their development, drawbacks and attendance. Since an ESL teacher in such a scenario has a range of responsibilities, this study particularly attempts to investigate the possibilities of using Artificial intelligence in the English as a second Language classroom in Sri Lanka to increase the productivity of the class and reduce the amount of responsibilities of the ESL teacher.

II. LITERATURE REVIEW

A. Artificial Intelligence Education

In 1950s, Alan Turing proposed a solution to the question of when a system designed by a human is 'intelligent.' Turing proposed the imitation game, a test that involves the capacity of a human listener to make the distinction of a conversation with a machine or another human; if this distinction is not detected, it is regarded as an intelligent system, or artificial intelligence (AI) [8].

When the contemporary situation of education is concerned, AI has already been playing a significant role in the administrative section of several world-renowned universities. For example, universities already use an incipient

form of artificial intelligence, IBM's supercomputer Watson. This solution provides student advice for Deakin University in Australia at any time of day throughout 365 days of the year. Even if it is based on algorithms suitable to fulfill repetitive and relatively predictable tasks, Watson's use is an example of the future impact of AI on the administrative workforce profile in higher education [8].

However, Stefan and Sharon (2017) argues that it is important to admit the current limits of technology and admit that AI is not yet ready to replace teachers, but is presenting the real possibility to augment them [8]. They argue that when the real potential of AI is properly used it would be able to extend human capabilities and possibilities of teaching, learning, and research.

In the similar manner, Micheal J. Timms (2016) proposes that the field of AIED is now mature enough to break away from being delivered mainly through computers and pads so that it can engage with students in new ways and help teachers to teach more effectively [7]. He brings forth the notion of an "Educational Cobot", a robot designed to support human teachers. He further discusses that having educational cobots in the classroom would aid the teacher to differentiate instruction so that learners receive more tailored teaching [7].

Underwood and Luckin (2011) discusses the necessity of using AI in education and they state that a key motivation for using AI techniques in the development of Technology Enhanced Learning is to support the development of systems that help teachers and learners to do the right things to maximize learning. This involves understanding and modeling learners, teachers, effective pedagogies and learners' contexts. AIED systems are adaptive, offering support dynamically by responding appropriately to changing and incomplete information about learning objectives, learners, collaborators and context [10]. In the paper, they elaborate on a current AI system being functioned in Carnegie Learning where they use AI techniques to provide learners of Mathematics with individualized attention and tailored material based on continual assessments. These Cognitive Tutors aim to act like human tutors constantly monitoring learner actions and guiding learners towards correct solutions, providing help on demand and in response to common mistakes and giving meaningful feedback to students on their acquisition of skills [10]. Moreover, they elaborates that through Personalisation of the system, it allows learners to work at their own pace, receive targeted feedback, and be supported in their learning without relying on teacher presence. Further, having a flexible learning experience with the support of AI is a way of improving the use of both learner and teacher time, and face-to-face teaching can be replaced by online teaching, individual learning and group work [10].

In the most recent study of Kessler (2018), he argues that Modern learning management systems, along with social media sites, provide a window into such activity in a way that has allowed teachers to understand students' abilities and challenges better. He states that this knowledge can be used to design individualized instruction that caters to specific student

needs, including increased uptake of feedback and awareness of linguistic forms. Along with the intervention of increasingly intelligent tools, this type of gathered data can be used to create customized, on-demand feedback and guidance that will address issues related to accuracy in language production as well opportunities to expand fluency and that can be disseminated at the points in the learning process where they are most salient to the learner. Therefore, he concludes that the data gathered through artificial intelligence can thus provide learners with individualized and appropriate support [5].

B. Components of Artificial Intelligence Education

Computer-based training (CBT) and computer-aided instruction (CAI) were the first such systems deployed as an attempt to teach using computers. In these kinds of systems, the instruction was not individualized to the learner's needs and the learner's abilities were not taken into account [2]. While both CBT and CAI may be somewhat effective in helping learners, they do not provide the same kind of individualized attention that a student would receive from a human tutor. (Bloom, 1984.)

For a computer based educational system to provide such attention, it must reason about the domain and the learner. This has prompted research in the field of intelligent tutoring systems (ITSs). ITSs offer considerable flexibility in presentation of material and a greater ability to respond to idiosyncratic student needs. These systems achieve their "intelligence" by representing pedagogical decisions about how to teach as well as information about the learner. This allows for greater versatility by altering the system's interactions with the student.

Woolf (1992) has identified four major components in Artificial Intelligence education as: the student model, the pedagogical module, the domain knowledge module, and the communication module [11], and in addition, Beck, J, Stern., M., & Haugsjaa., E., (2005) have identified a fifth component as the expert model [2]. The functions of these five models can be simply elaborated as follows.

1. Student Model stores information on every learner in a class such as attendance, assignment marks etc.

2. Pedagogical Module provides a model of the teaching process, such as student review dates, suitable moment to give the students a new topic to write, and the best topic for a writing activity etc. More importantly, this model can communicate with the student module and assess the proficiency level of every student to choose the best teaching process to assure the quality of the class.

3. Knowledge Domain stores all the information, in ESL situation, grammar, vocabulary, reading comprehension skills and listening skills and all the lessons and activities the teacher has prepared to do in the class. This is considered as the most important component as, without it, there would be nothing to teach the student.

4. Communications Module carries out interactions with the learners in the class including verbal communication, e-mail handling and the screen layouts.

5. Expert Model is similar to the domain knowledge since it must contain the information being taught to the learner. However, it is more than just a representation of the data; it is a model of how someone skilled in a particular domain represents the knowledge and is capable of solving problems in the domain, and this model can compare its solution to a problem with the learner's solution and pinpoint the places where the learner has to improve. In ESL context, the expert model can compare its grammar with the learner's grammar and point the areas they should reconsider.

The following diagrams show how these five models interact with each other.

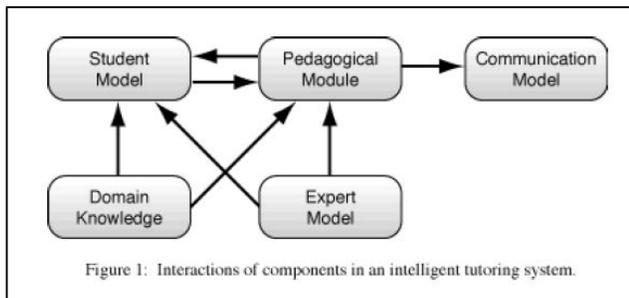


Figure 1: Interactions of components in an intelligent tutoring system.

(Beck, J, Stern., M., & Haugsjaa., E., 2005, P2)

C. AIEd in the ESL classroom.

“Intelligence Unleashed. An argument for AI in Education” offers a comprehensive account on the current use of AIEd in ESL classroom and the future of its horizons [6]. According to Luckin, Holmes & Griffiths [6], there key models at the heart of AIEd: the pedagogical model, the domain model, and the learner model, which have the functions discussed above. In addition to the aforesaid, there are Open Learner Models, which present the outcomes of the analysis back to the learners and teachers. These results tend to carry information about each learner's achievements, their proficiency level, and their development, which are valuable for the teachers to understand each student's approach to learning, and allow them to shape future learning experiences appropriately. At the same time, Open Learner Models can motivate the learners by providing them with the details of their progress in learning. In addition to these uses, many institutions use AIEd and educational data mining (EDM) techniques to keep track on the student behaviors, i.e. class attendance, assignment submissions and marks to identify and support the students who tend to drop out of the colleges.

Moreover, “Intelligence Unleashed. An argument for AI in Education” introduces three categories of AIEd software applications to support teaching and learning process [6]

1. Personal tutors for every learner is one-to-one human tutoring, which is the most effective approach to teaching and learning. However, it is considered as impractical as there will

not be enough personal tutors for every learner and it would be expensive.

2. Intelligent support for collaborative learning has been suggested to use between a pair of students undertaking a project together or a community of students participating in an online course because it has been proven to have higher learning outcomes than learning alone. On the contrary, several studies argue that group members might not have the social interaction skills needed to collaborate effectively. This can be especially difficult in the context of online collaborations, where participants rarely meet in person.

3. Intelligent virtual reality provides authentic experiences that simulate some aspect of the real world to which the user would not otherwise have access. For instance, a flight simulator, provides a situation a pilot student cannot experience in real life, the student is provided with a real scenario and his responses, and development is tracked during his training.

Thus, the AIEd offers a multi-faceted approach to teach and learning, and several components from these can be used to improve the three core components of learning: curriculum, learning and teaching, and assessment.

The study “Exploring AI language assistants with primary EFL students” (2017) explores the practicality of incorporating voice-driven Artificial Intelligence (AI) effectively in classroom language learning [9]. He conducted a nine-month research study employing Amazon's Alexa, Apple's Siri, Google voice search, and co-design methods with a class of primary age English as a Foreign Language (EFL) students to explore and develop ideas for classroom activities using AI language assistants. The results revealed that speaking to AI assistants was considered highly engaging by all students, and it was evident that students spoke more English when using AI assistants in group work compared to a teacher environment. Moreover, the spontaneously engaged in self-correction and were enthusiastic to get AI assistants to do what they wanted them to do. This study proved that learning experience can be effortless and joyful when using AI assistants.

In addition, Jeonghye Han (2012), proves the necessity for incorporating Artificial Intelligence in Education by stating Drivers for such research include the desire to give individual students more attention in large classes and the observation that children often enjoy talking to robots and are more relaxed about using a foreign language to speak with machines than with humans [4].

Moreover, in the study of Alemi, Meghdari, and Ghazisaedy (2015), which aimed to examine the effect of robot assisted language learning (RALL) on the anxiety level and attitude in English vocabulary acquisition amongst Iranian EFL junior high school students conducted an experiment with forty-six female students, who were beginners at the age of 12. They were randomly assigned into two groups of as RALL (30 students) and non-RALL (16 students). However, in the RALLgroup, the treatment was given by a teacher

accompanied by a humanoid robot assistant. Two questionnaires of anxiety and attitude were utilized to measure the students' anxiety and attitude. The results indicated that there was lower anxiety and a more positive attitude towards English vocabulary acquisition in the RALL group compared with those in the non-RALL group. The study showed that the students in the RALL group had great fun in the learning process; they also believed they were learning more effectively, which helped them boost their motivation in the long run. Thus, their study provides new insights into the use of technology in the language classroom, suggesting that teachers and material developers should integrate technology into the language learning process [1].

As far as the related literature are concerned, multiple nations are using AI as a support to education, specifically ESL / EFL classrooms. However, there has not been any attempt in Sri Lanka to familiarize this approach to the ESL classroom. This may be due to Sri Lanka being a developing country, nonetheless, it is vital to assess the future possibilities of having AIED in the classroom. Therefore, as a pilot attempt, this particular study intends to examine the possibilities of AIED in the Sri Lankan ESL classroom.

III. METHODOLOGY

As the initial step, to gather a clear idea about the nature of ESL classrooms in the University, a questionnaire was given to the lecturers at the Department of English Language Teaching. The common characteristics of an ESL classroom was taken and it was hypothesized that every ESL classroom has these characteristics. As the following step, the three core components of learning: curriculum, learning and teaching, and assessment [6], were focused to discuss the extent to which AI can be employed in the classroom in Sri Lanka. As the outcome of the study, a concept of how the AIED is employed in an ESL classroom in University level is developed.

IV. RESULTS AND DISCUSSION

The common characteristics of a Sri Lankan ESL classroom are essential for the discussion to assess the nuances of AIED in Sri Lankan context. The findings from the questionnaire given to the lecturers at the Department of English Language Teaching who are conducting classes for Level one undergraduates at the faculty of Social Sciences revealed the following common characteristics / issues of an ESL classroom.

1. Having students more than 40
2. A class with a range of proficiency levels since they were not classified according to their levels.
3. Having a majority of the students with lower-proficiency levels with few intermediate students
4. Lesson plan developing to match the proficiency levels of every student
5. Inconsistency in attendance
6. Limited time period of teaching and assessing
7. Numerous documentation during the assessing process

These characteristics were hypothesized to be in a general ESL classroom. The following discussion elaborates on the possibility of having AIED in an ESL classroom to solve these said issues in three categories: curriculum, learning and teaching, and assessment, along with the documentation process of an ESL class.

AIED for Curriculum design in the ESL classroom

The Sri Lankan ESL classroom has students with different levels of proficiency and it is rather difficult to design lessons that cater to all their language needs. More importantly, majority of the students are in lower proficiency levels and their language issues include: inability to construct correct SVO sentences, issues with tenses, inability to use inflection for verbs according to tenses, inability to use derivational suffixes properly. In contrast, there are several students with advanced proficiency skills who are capable of constructing complex sentences, passive voice sentences and have some sound vocabulary skills. However, both these groups are weak in speaking and listening areas. Moreover, the limited time of four hours per twelve weeks is not adequate for solving all these language issues.

AIED can be employed to handle the curriculum designing by designing the lessons that have a mixture of both simple and difficult language components. On the first day of the class, a student can be given an online test covering all the four areas of language learning: Reading, writing, speaking and listening, and the results will assess his proficiency level. Then, the AI will use the information in the Knowledge domain to design a personalized lesson for every ESL learner in the classroom. The AI will consider the proficiency level, and language issues of a particular learner and design a personalized lesson for him / her with the use of information in the knowledge domain. For instance, if the area to be covered is present simple and present continuous tense, the AI will check the results of STUDENT A for the said sentences. If the student has problems with the basics, it will design a lesson from the beginning, including the explanations, grammar patterns, contextualized examples, and activities expanding from the easiest to the hardest. It will add reading comprehension activities, listening and speaking components such as "explain your daily routine and what you are doing at the university these days". Similarly, if the STUDENT B has adequate knowledge in simple present and present continuous tenses, what he/she needs most is the knowledge of their specific uses and speaking and listening training. In such a situation, the AI will design a lesson for him/her with a comparison of the two tenses, the special uses and exceptional cases.

When the ESL teacher's role is considered, he/she will have a schedule of the lessons he/she going to do and the AI will inform him/her about the lesson designed for the particular period. It will provide a summary of the personalized lessons and give a list of students who have scored less in their first-day online test to inform her to give more attention to them. During the class time, the teacher will

be assisting the students when they are going through their personalized lessons.

In such a scenario, the student is the centre of learning and the teacher is only the assistant, and the student is more active in learning since he/she is not listening to a lecture. Further, the typical problem of having some students bored because they already know what the teacher is doing, and having some students who do not understand anything in the lecture will be solved. In the traditional scenario, the ESL teacher does not know whether the students understand the lesson because their response level is very low, but using this approach, the teaching speed and style is personalized to match each learner's proficiency level.

AIED for Learning and Teaching in the ESL classroom

The traditional Sri Lankan ESL classroom has more than forty students, i.e. schools and tuition classes, and it is difficult for the ESL teacher to pay attention to every learner in the class within two hours of time. In addition, inconsistency in attending lectures has become another problem in university level because the first year undergraduates are facing the ragging season. Therefore, a majority of the students miss more than 60% of the lessons they are taught, which cause many failures at the semester-end examination. In the typical scenario, the students are given printed handouts and the absent students take the handouts in the following week for the lessons they missed, however, they miss lessons.

For such a scenario, the AI can be used to store all the personalized lessons of a particular student and if he/she misses a class, they will have to do the lesson before coming to the class in the following week. Since the lessons are stored and the system marks their answers, they are not in a risk of missing the lessons.

Moreover, in the traditional scenario, the ESL teacher does not have time to pay individual attention to every student. The teacher has few consultation hours for the students to come and meet them for any clarification if needed. However, this arrangement costs time for both the teacher and the learner. The AIED can assist students who need further clarifications by allowing them to forward their questions to the teacher, who is also available in the platform. The teacher can answer the questions using her laptop/PC /Tab. Otherwise, the student who need some clarification can post it in a common page (similar to Facebook), and everyone in the class can comment and explain it to the particular student. This would be an ideal situation to improve interaction by exchanging language knowledge. Meanwhile, it will save time of both parties and will not limit the learning process into the classroom.

AIED for Assessment in the ESL classroom

In a ESL classroom assessment is the final stage of checking the learner's knowledge and the teacher should keep track of the learners' language development as well as their errors to avoid fossilization. In the current scenario, the teacher designs the assessment, choose a day, conducts the assessment, gives marks, and finalizes the documents. For a class of 40 students, if the assessment is a speaking test, it

would take 4 hours of time to complete the test. This would be a tiring effort, the assessing process will not be consistent since the teacher and the students both would be exhausted after 2 hours, and it would affect the marks of the students who face the test at the latter half of the day. In addition, it is not possible for the teacher to keep a track of the development of every learner, and if a student gets a low mark for the final test, the teacher is unable to find the reasons behind it. Similarly, most ESL learners have their language errors fossilized because the teacher could not correct them at the right moment.

In contrast, if the AIED is used for the assessing process, the ESL teacher uses the details of the students from the Student Domain in the AI and design an assessment that would suit every student in the class. Similarly, the teacher can feed in the marking criteria in to the system. The teacher can decide whether no release the final marks to the students or not. On a selected day, the learners can use the AI system to do the test, the system will give them the marks, and the areas they need to improve. The teacher will receive the finalized mark sheet and the list of error and focus areas of every student, so that he/she can focus on those when giving feedback and clarifications to the students.

Moreover, the AI system can be used to store the individual details of the language development pattern of every ESL learner along with the assessment marks and at the end of the course, the learners and the teacher can have a look at their development.

In addition, when the AI keeps track of the errors of the learner, the teacher can identify the errors that are in a risk of being fossilized and the ESL teacher can design special lessons for those students.

AIED for Documentation Process in the ESL classroom

The documentation process in the ESL classroom includes enrolling new students, keeping record of the attendance, and keeping record of the assessment marks. In the typical ESL classroom, the teacher keeps separate files and manually marks everything, which is a process prone to mishaps and in the meantime, consumes time.

If the AIED is employed, the teacher can keep these above said documents online. When a new student comes, he/she can fill out the online registration forms and get enrolled and his/her name will be added to the list in the teacher's drive. When the attendance is taken, the AI will count in the students who have logged into the system as "Present" and the ones who have not logged in as "absent". In the same manner, the system will keep the assessment marks, student development records in the teacher's drive.

Components of the Conceptual AIED in the ESL classroom in Sri Lanka

The four major components in Artificial Intelligence education according to Woolf (1992) are Student Model, Pedagogical Module, Knowledge Domain, Communications Module [11], and Expert Model, which is introduced by Beck.

J, Stern., M., & Haugsjaa., E., (2005). The concept developed in this study has the followings under these five components.

i. **Student Model** contains all the details of every student, including their basic information, initial online test results, attendance, assessment results, development pattern, frequently committed errors, and personalized lessons

ii. **Pedagogical Module** includes the syllabus, course content, learning objectives, class timetable, assessment dates, range of topics for speaking activities, a collection of listening practice materials and grammar and reading components.

iii. **Knowledge Domain** contains all the grammar rules, vocabulary, writing tips, and reading comprehension tips that are necessary to develop personalized lessons.

iv. **Communications Module** maintains the communication between the teacher and the students and this will create an interface similar to social media where the teacher and the students can discuss and solve the language issues they have during the learning process. Moreover, this component has all the records of the students' inquiries for clarifications from the teacher, personal messages to the teacher and other fellow students

v. **Expert Model** contains all the linguistic theories that are necessary to explain grammar and morphology of English to the ESL learners. Moreover, it actively participates in answering the activities given to the students, comparing its answers with the students and identifying the areas to improve to make changes in the personalized lessons.

vi. **Role of the teacher in the Sri Lankan ESL classroom** is more of a guiding figure and a manager rather than a traditional teacher. He guides each student through the lessons and gives clarifications where necessary. Meanwhile, he manages the system and oversees the learning process.

vii. **Role of the student in the Sri Lankan ESL classroom** is central and independent. The students will work on their own pace and make independent choices of their lessons. Moreover, they will be more informed about their progress in learning.

V. CONCLUSIONS

The study attempts to address the negative characteristics / issues in the ESL classroom by using a concept of AIED in the Sri Lankan ESL classroom. The conceptual model under discussion is capable of saving time and energy spent for documentation and allocates them solely for teaching and learning purpose. Moreover, it deviates from the lecturing method and provides a self-learning approach with the ESL teacher as an assistant. Since the students have access to personalized lessons, to view their development records and their frequent errors, to communicate with teacher and others

when they need clarifications and to learn the lesson at home, if they were absent, the AIED would provide an active and interesting learning environment. However, to initiate this AIED approach, both ESL teachers and learners should have a sound knowledge in handling a computer, the classes should have computers for all the students with internet connection, and there should be experts to maintain the AIED system.

As future studies in this area, it is suggested to develop a tentative model and run a feasibility study to assess its practicality in a real ESL environment in Sri Lanka.

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