The Use of Artificial Intelligence (AI) in Planning Differentiated Learning for Malay Language Teaching and Learning

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ABSTRACT

Artificial Intelligence (AI) is one of the rapidly growing technologies in education. In the context of Malay language teaching and learning, the use of AI is seen as a tool to assist teachers in planning and implementing instruction according to the individual needs of students in the classroom, taking into account their understanding, learning styles, and cognitive levels. The rapid development of AI technology has opened up various opportunities for teachers to enhance the quality of education, particularly in personalizing the learning process based on each learner's needs. Accordingly, this study focuses on exploring the use of AI in planning differentiated learning for Malay language teaching and learning in schools. The aim of this study is to identify the concept of AI in differentiated instruction, the issues in differentiated Malay language teaching and learning, and proposed solutions to these issues through the use of AI. This study uses a literature review method, with information obtained from journals, proceedings, articles, and books. In addition, empirical findings from previous studies are incorporated to support the discussion on the effectiveness of AI in enhancing differentiated instruction.

The analysis from this study can serve as a reference for educators in addressing the challenges of differentiated learning by optimally leveraging advanced technologies such as AI in education.

Keywords: Artificial Intelligence (AI), Malay language, differentiated learning, technology, personalized learning

INTRODUCTION

In recent times, the national education system has become a topic of public interest and debate. High expectations placed by parents have raised concerns about the capability of the education system in sufficiently preparing the new generation to face the challenges of the Fourth Industrial Revolution (IR 4.0) in education (Kamaruddin Ilias & Che Aleha Ladin, 2018). The paradigm shifts outlined in the Malaysian Education Development Plan (PPPM 2013-2025) are taken seriously by the Ministry of Education Malaysia (MOE) in its aim to develop students holistically, without disregarding differences in needs, cognitive abilities, and backgrounds (Zurina Mustaffa et al., 2021). Therefore, efforts to produce adaptive and competitive students who are ready to face future life challenges have become a primary focus.

The transformation of the national education system emphasizes talent development and human capital in digital education so that students' diverse potentials can be optimized to master knowledge, skills, and attitudes related to technology and digital literacy, in line with their varying cognitive levels (Suhaimi Ahmad et al., 2024). This strategic plan by MOE to strengthen digital education is explicitly stated in Shift 7 of the PPPM (2013-2025), which is to leverage Information and Communication Technology (ICT) to improve the quality of learning in Malaysia. In an effort to realize the goals of the PPPM (2013–2025), the diversity in student tendencies, motivation levels, knowledge, and learning styles poses a major challenge for Malay language teachers (Mohd Ayub Bakri & Zamri Mahamod, 2023).

Nevertheless, teachers can master and utilize ICT, as the development of the Fourth Industrial Revolution has introduced various new technologies, such as Artificial Intelligence (AI), which can be used in education to

improve the quality of learning so that the needs of all students in the classroom can be met (Juwika Afrita, 2023). Therefore, to meet students' learning needs, the use of differentiated teaching approaches can be integrated with Artificial Intelligence (AI) as a method of teaching and learning, to ensure that all students master the learning content, especially in the Malay language subject. According to Tamirat & Chen (2020), differentiated instruction refers to the diversity of student learning styles and the right to learn fairly regardless of their background. Hence, the variations among students in terms of behavior, cognition, emotion, social skills, and physical abilities must be taken into account when planning Malay language instruction in the classroom to ensure smooth teaching and learning (Ain Nur Atika, 2021).

On the contrary, if these diverse student factors are neglected by teachers, it could contribute to an increased dropout rate (Zamri et al., 2015). The failure of teachers to plan and implement teaching and learning methods for students with various achievement levels in the same classroom may lead to a loss of interest and focus among students. Due to several factors present among students, such as readiness level, interests, and learning profiles, various issues arise when implementing differentiated instruction in the classroom. However, with the advancement of the Fourth Industrial Revolution, various ICT-based educational innovations, such as Artificial Intelligence (AI), can be used alongside differentiated instruction in the Malay language subject (Muhammad Saiful Haq et al., 2022). If AI can be effectively utilized by teachers especially in Malay language teaching, various activities aligned with students' learning levels can be designed and implemented. This is because the utilization of ICT, particularly AI, can serve as a catalyst in providing a more comprehensive understanding of lessons, as it enhances student engagement (Salbihana binti Samsudin et al., 2024).

Objectives of the Study

This study aims to achieve the following objectives:

i. To discuss the teaching and learning (T&L) issues related to differentiated learning in the Malay language.
ii. To discuss proposed solutions to teaching and learning issues related to differentiated learning through the use of Artificial Intelligence (AI).
iii. To discuss the positive implications of using Artificial Intelligence (AI) in planning differentiated learning.
iv. To discuss the negative implications of using Artificial Intelligence (AI) in planning differentiated learning.

Importance of the Concept Paper

To address the challenges of current educational technology, research on Artificial Intelligence (AI), especially in planning differentiated learning, is highly important. Therefore, this concept paper is written to serve as a reference for stakeholders in the education sector to improve the current quality of education through the utilization of AI. This is aligned with the view of Elizabeth Langran et al. (2024), who emphasize that technology developers, policymakers, administrators, teachers, and students must all play a significant role in promoting the use of AI in education. The discussion on the importance of this concept paper will be divided according to several key stakeholders: the Ministry of Education Malaysia (MOE), State Education Departments (JPN), District Education Offices (PPD), schools, teachers, and students.

A. Ministry of Education Malaysia (MOE)

As the policymaker and planner of the national education system, the MOE requires findings and data to guide the implementation of new initiatives. This is particularly important when it involves something new and unprecedented, such as the use of AI in differentiated learning. According to Ouyang and Jiao (2021), while the use of AI in education brings new opportunities and potential, it also presents challenges in its implementation. Therefore, this concept paper is expected to assist the MOE in planning more effective education policies, especially related to the use of AI in differentiated Malay language learning. The paper includes discussions of implementations already carried out in foreign education systems that could serve as models for our own. Additionally, this concept paper can help the MOE manage resources and allocations

more efficiently based on the data and research findings presented. For example, it can guide appropriate ICT facility allocations in schools to support teachers in planning differentiated learning using AI.

B. State Education Departments (JPN)

The State Education Departments are the second-highest authority in the national education management structure after the MOE. All policies and directives issued by the MOE must be led by the JPN, including the integration of AI in teaching and learning. One of JPN's main roles is to lead the effectiveness of curriculum implementation, pedagogy, and assessment through the empowerment of the District Education Offices (PPD), with the necessary support and guidance. However, this support must be accurate and responsive to the current needs of the PPD. Inaccurate support can result in wasted resources at the state level. Educators and teachers with low knowledge or experience in AI will find it difficult to adapt to this technology and may be reluctant to use it (Xieling Chen et al., 2022). Thus, this concept paper is expected to assist JPNs in planning relevant material and non-material support for PPDs.

C. District Education Offices (PPD)

At the district level, PPDs are responsible for leading strategic education development planning and managing the operation of schools under their jurisdiction. The implementation of AI in differentiated Malay language learning in schools can only become a reality if PPDs effectively lead the planning process. This is because AI-related guidance and support differ based on the socioeconomic background of each region. For instance, the form of AI support in urban schools would differ from rural schools, as urban students generally perform better in Malay due to infrastructural advantages and family education backgrounds. Therefore, the use of AI in differentiated Malay learning must consider these factors to ensure the teaching and learning process is appropriate and effective. This concept paper can help PPDs gain insights into the type of support and guidance needed according to the socioeconomic context of the schools in their districts.

D. Schools

Schools are the primary educational institutions where students acquire knowledge. In other words, schools play a direct role in the development and delivery of knowledge. As such, schools are crucial in ensuring that students are shaped into holistic individuals capable of competing in today's educational landscape. AI can significantly assist in planning differentiated learning so students can learn according to their interests and abilities. However, such integration can only happen if schools recognize the importance of AI in current pedagogy. In fact, AI is not limited to planning differentiated instruction but can also be used to analyze student achievement data and store it using pattern recognition technology. Thus, this concept paper is expected to help schools plan for continuous and effective student performance monitoring using AI. At the same time, it can help schools understand the capabilities of AI in designing effective interventions according to student needs through expert systems.

D. Teachers

Teachers are the individuals directly responsible for delivering knowledge to students in schools. As change agents, teachers help shape students according to their unique potentials. Therefore, this concept paper is vital for teachers as it provides ideas on planning differentiated learning while taking into account student levels and abilities, supported by AI-generated data analysis. According to Hwang et al. (2020), one of the goals of AI in education is to support and personalize learning according to the student's tendencies, background, and characteristics. Moreover, the concept paper also assists teachers in planning more meaningful assessments tailored to student preferences.

E. Students

Students are the most important stakeholders in our national education system. Any policy or decision made at the top level will directly affect them. Therefore, if AI is integrated into differentiated learning in the classroom, students are expected to benefit from more meaningful learning experiences that align with their

level and interests. They will no longer be forced to learn in ways they find unappealing. In addition, the recommendations presented in this concept paper can help students maximize their potential through learning activities tailored by teachers with the help of AI tools.

In summary, this concept paper offers significant value to all stakeholders in the education system. It will help them understand the potential of AI in planning differentiated Malay language learning through its underlying concepts, while also raising awareness of AI's role in modern education.

Concept of Differentiated Learning

The diversity among students in the classroom clearly indicates that a "one-size-fits-all" teaching approach is no longer suitable in today's education system (Bondie et al., 2019). Since 2019, class streaming has been abolished, making it necessary to move away from uniform teaching methods, as a single classroom now contains students with a wide range of abilities. These differences include students' capabilities, achievements, interests, learning readiness, backgrounds, and learning profiles. As a result, teachers must diversify their instructional strategies to ensure that all students have the opportunity to understand and master the content, rather than merely completing the syllabus (Basirah Abu Bakar et al., 2018). According to Hamir and Mohamad Hilmi (2019), students are more likely to be actively involved in the teaching and learning process when teachers acknowledge and accommodate their individual differences, which in turn helps them achieve intended learning goals. Therefore, differentiated learning is a teaching method designed to meet the varied learning needs of students based on their diverse cognitive levels (Zurina Mustaffa et al., 2021).

Differentiated learning is a contemporary pedagogical approach that teachers proactively implement by modifying content, process, product, and learning environment according to students' cognitive readiness (Ain Nur Atika Agus, 2021). It is considered a flexible pedagogy because teaching methods are adapted to students' diversity to ensure that all learners are treated fairly and equitably in achieving learning objectives (Abd. Khahar et al., 2018). This approach is highly appropriate for classroom use as it not only provides flexibility but also allows teachers to adapt lesson content and teaching strategies based on their students' needs. Abdul Razaq Ahmad et al. (2010) argue that differentiated learning transforms conventional instructional approaches into more engaging ones, enabling students to better explore and understand content. As such, differentiated learning offers students the opportunity to learn in ways that align with their unique characteristics. The concept of differentiated learning is illustrated in Figure 1 below.

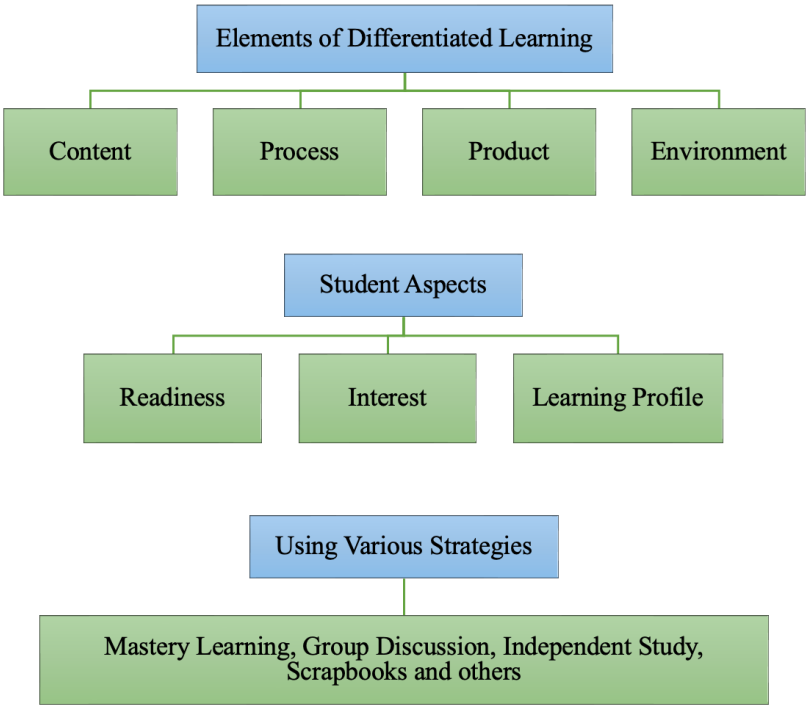

Fig. 1. Concept of Differentiated Learning

Figure 1 above illustrates the concept of differentiated learning introduced by Carol Ann Tomlinson in the United States in 1995 (Tomlinson, 2014). Differentiated learning requires teachers to be more creative and proactive in modifying curriculum content, such as teaching resources, instructional methods, assessment of learning outcomes, and accommodating student diversity within the same classroom (Zuraidah Abdul et al., 2023). There are four core elements in differentiated learning that teachers can modify: content (the material to be taught), process (the learning activities), product (the outcomes of student learning), and environment (the physical or emotional climate of the classroom). These elements should be adjusted based on three key aspects: student readiness (knowledge, understanding, and skills related to the topic), interest (motivation and curiosity), and learning profile (learning style, intelligence, gender, and cultural background).

Before adapting these elements, Tomlinson (2017) outlines six essential guidelines for implementing differentiated learning. First, teachers must get to know, understand, and assess their students before modifying the content so students feel valued and recognized. Second, teachers should clearly explain key concepts, generalizations, principles, and main ideas that give structure and meaning to the lesson and curriculum. Third, teachers must plan appropriate methods of assessment. While assessments are commonly conducted at the end of a lesson, they can also be adjusted to suit the students' needs. Fourth, teachers should build lessons that promote critical and creative thinking through tasks that match students' varying levels of ability (low, moderate, or high). Fifth, lessons must be designed to involve all students actively regardless of their academic level. Lastly, teachers should balance the types of tasks assigned based on students' needs and interests. Overall, these guidelines help teachers effectively achieve maximum learning outcomes through a tailored and inclusive teaching approach.

Elements of Differentiated Learning

According to Tomlinson (2014), there are four key elements in differentiated learning that teachers can adapt based on student diversity: content, which refers to the lesson material or skills being learned; process, which refers to modifications in teaching strategies through planned and executed activities; product, which refers to the outcomes demonstrated by students according to their varied abilities; and learning environment, which refers to the classroom atmosphere that must ensure comfort for students, including desk arrangements, informative wall displays, and facilities such as fans and lighting provided by the school.

A. Content Element

A proactive teacher is one who can distinguish and modify curriculum content so that it aligns with the students' cognitive levels (Zurina Mustaffa et al., 2021). The content element in differentiated learning refers to the subject matter delivered to students. Brigandi et al. (2019) suggest that teachers can modify lesson content by matching each topic, concept, skill, or generalization to the students' ability levels. This is necessary because students within a single classroom may have varying levels of mastery, ranging from high to moderate to low. For students with high mastery, the teacher can provide more complex materials, while for students with lower mastery, simpler teaching materials should be prepared.

B. Process Element

Differentiated learning in terms of process refers to students performing the same activities but through different learning processes (Siti Aishah Hassan & Che Suriani Kiflee, 2018). This element relates to how students learn the lesson content. Teachers can vary their teaching methods, strategies, and techniques to suit the diversity within the classroom. Learning processes may differ depending on whether instruction is delivered individually, in small or medium groups, or to the entire class. Teachers may also adapt the process according to students' learning styles, whether verbal, visual, auditory, or kinesthetic. Furthermore, teachers can consider students' interests when designing differentiated process strategies, as every student has unique preferences. According to Muzarina Juhari et al. (2019), teachers can identify students' learning strengths by observing how they prefer to complete tasks, for instance, using mind maps, conducting internet research, interviewing the community, or building models.

C. Product Element

Differentiation in product refers to the outcomes produced by students at the end of the learning session, which reflect their understanding and mastery of the content (Muhammad Nanang Suprayogi & Valcke, M., 2016). Students may produce a variety of outputs, such as reports, projects, scrapbooks, or research findings using applications like Canva, according to their preferred learning styles. However, student responses during the lesson are not considered part of the product element, as products refer to final outputs created after the teaching session. Therefore, teachers can differentiate product by assigning learning tasks that align with each student's readiness, interest, and learning profile and by assessing students based on what they present as their final product.

D. Learning Environment Element

Differentiation through the learning environment refers to the physical or emotional space provided for students to learn (Siti Aishah Hassan & Che Suriani Kiflee, 2018). According to Zurina Mustaffa et al. (2021), a conducive learning environment whether inside or outside the classroom can influence students' motivation and interest to learn. This aligns with the view of Maker and Shiever (2005), who state that students' sustained focus is influenced by a positive classroom climate, which may include academic play areas, reading corners, academic magazines, and more. Additionally, classroom arrangements such as desk positioning, lighting, and other physical aspects can support and attract students to learn while encouraging positive social interaction. Hence, teachers must be flexible and proactive in ensuring that classroom settings are always organized and appealing so that a conducive learning atmosphere is fostered.

The Concept of Artificial Intelligence (AI)

Artificial Intelligence, or AI, has a long and continuous history of development, constantly improving over time. In line with the Fourth Industrial Revolution, the use of AI is becoming more widespread and diverse, as technology is now more significant than in the past (Pongsakorn Limna et al., 2022). Generally, AI is a supercomputer technology that possesses processing capabilities, the ability to adapt using sensors, and various other features that allow AI to exhibit cognitive functions and human-like capabilities, thereby enhancing the performance of supercomputers (Lijia Chen et al., 2020). These abilities are made possible by specific technological components within AI. The following are the main components of AI that enable it to mimic human intelligence.

A. Machine Learning

One of the most important components in AI that allows it to make decisions like human intelligence is Machine Learning. Computers can learn from new datasets using algorithms. Algorithms in machine learning are programmed to identify patterns or trends (Hui Luan and Chin Chung Tsai, 2021). Once programmed, a machine learning model can generate outputs using new data. Furthermore, machine learning can adapt to changes in data, making it more accurate and efficient over time.

B. Deep Learning

Technological advancements have led to the creation of computers with Deep Learning capabilities. Deep Learning is a key component of AI, consisting of a group or subset of computing systems inspired by the structure of the human brain. This is because Deep Learning uses Artificial Neural Networks that are layered and interconnected to recognize patterns and analyze complex data, similar to how the brain functions (Terrence J. Sejnowski, 2021). Therefore, Deep Learning technology is capable of recognizing images, processing language, and analyzing complex data.

C. Natural Language Processing (NLP)

Natural Language Processing (NLP) technology has enabled AI to perform with human-like abilities and efficiency in understanding and interpreting language. NLP refers to machines that are trained to understand, translate, generate, and provide meaningful responses to human language (Jacklyn Gunadi & Budi Setiawan,

2024). NLP consists of several core linguistic components such as syntax, semantics, pragmatics, morphology, and phonetics and phonology. Using these components, NLP processes text data, converts the text into numerical form for easier analysis, applies AI models to analyze and generate language, and finally produces meaningful output based on the original text input.

D. Computer Vision

Another component of AI that replicates human intelligence is Computer Vision. This technology allows machines to interpret, analyze, and understand visual data such as images, videos, and real-world scenes. Computer Vision enables AI to function like the human eye by recognizing and classifying images, detecting objects, segmenting images, identifying text through Optical Character Recognition (OCR), and tracking movements (Xun Zhang et al., 2022).

E. Expert Systems

AI's ability to imitate human decision-making is made possible by the component known as Expert Systems. Expert Systems use knowledge bases and sets of probabilistic rules to provide suggestions and solutions for complex problems. Inputs are provided by users in the form of stimulus questions or problem scenarios. These inputs are then analyzed using relevant knowledge bases and "If-Then" probability rules. Finally, the system generates output in the form of suggestions, problem-solving strategies, and explanations based on the analysis that addresses the given input.

Artificial Intelligence (AI) in Differentiated Learning

According to Fengchun Miao et al. (2021), the components of AI are capable of assisting both teachers and students in learning, such as providing classroom activities for different levels, giving feedback to students on their writing, and supporting collaborative learning as students observe, discuss, and gather information. Furthermore, AI is equipped with learning applications such as Personalised Learning Systems, making differentiated learning implemented by teachers easier and more efficient (Akgun and Greenhow, 2021). As discussed earlier, there are many components that allow AI to function like a human being. The following is a detailed explanation of AI components that can help teachers implement differentiated learning in the classroom.

A. Machine Learning

The ability to make decisions like a human makes AI a potentially powerful tool to support Differentiated Learning. It is common for classrooms to consist of students with various achievement levels. Not only that, but the interests and tendencies of students can also vary, even within the same classroom. Therefore, this Machine Learning component of AI can support Differentiated Learning by suggesting suitable learning activities for a classroom (Manaswini Davuluri, 2021). These suggestions are derived from algorithms and patterns identified beforehand. In addition, with Machine Learning, AI can also predict students' learning needs based on the data received, such as assessment scores.

B. Deep Learning

The Deep Learning component of AI can assist teachers in providing learning that matches the students' interests and levels. This is because Artificial Neural Networks in Deep Learning can analyse complex data such as varying student achievement and interests, and then generate activity suggestions that teachers can use in their lessons. Not only that, Deep Learning can also assess student work with consistent marking patterns, reducing the teacher's workload.

C. Natural Language Processing (NLP)

The existence of Natural Language Processing (NLP) in AI components allows AI to be used for differentiated learning in various subjects, not just English. Therefore, AI is also suitable for differentiated learning in the Malay language in Malaysia. Among the advantages of NLP is its ability to recognise voice and speech. As such, AI can be used for listening and speaking practice for students with special needs.

D. Computer Vision

The Computer Vision component of AI can support Augmented Reality (AR) technology, which can produce various attractive visual learning materials. Different images can be generated according to the teacher's lesson topic. The images produced are in 3D form in the real world, making classroom learning more engaging and interactive. As a result, the visual images generated by AR, empowered by Computer Vision AI, can support students with low achievement or those with visual learning tendencies.

E. Expert Systems

The capabilities of Expert Systems within AI enable it to analyse and predict students' achievement and performance based on the data received. Through these outputs, teachers can determine what kind of intervention activities are needed to address students' learning issues. At the same time, this prediction is also enabled by the Computer Vision component of AI, which allows it to detect students' behaviour. From these behavioural analyses, AI can obtain data on students' learning patterns, and then prepare lesson activities that suit those needs.

In conclusion, all these AI components complement one another. The ability of AI to function like a human makes it an extremely useful tool for teachers in planning Differentiated Learning in the classroom. Therefore, the use of AI in Differentiated Learning is no longer a new concept, especially in other countries, and should be emulated in the current national education landscape.

Teaching and Learning Issues Related to Differentiated Learning in the Malay Language

There are several issues in teaching and learning using the differentiated learning approach that contribute to students' weaknesses in mastering the Malay language effectively. Although all students have different educational background profiles, they are entitled to receive the best education to achieve their maximum potential. Most Malay language teachers are still unable to meet the demands and objectives of the Ministry of Education Malaysia (MOE) in implementing the differentiated teaching approach that has been introduced since 2018 (Nuraishahtun Md Akhir et al., 2019). This is evident in the study conducted by Nuraishahtun Md Akhir et al. (2019), which found that some schools do not implement differentiated teaching for their students due to several factors. Such matters should not occur because the educational transformation carried out by the ministry is not merely to increase the workload of teachers but to equip both teachers and students with new skills to face the challenges of the 21st century.

Therefore, teachers need to master relevant skills, particularly in differentiated learning, to ensure quality teaching and learning for diverse students. Moreover, teachers must remain motivated and strive to continue educating in order to address problems or constraints in the teaching and learning process of the Malay language. This is because the aim of the Malay language curriculum carried by teachers is to ensure students are equipped with language and communication skills to meet personal needs in daily life, education and employment using correct and appropriate grammar (Irma Wani Othman et al., 2021). In light of this responsibility, teachers must give full commitment to ensure the content of the Malay language subject is taught as effectively as possible despite challenges arising from student diversity. Hence, all issues present in the implementation of teaching and learning related to differentiated learning in the Malay language will be discussed in this writing.

A. Teachers Tend to Use Traditional Methods

The choice and use of approaches in delivering knowledge to students play an important role in determining the effectiveness of teaching and learning in education. A teacher's failure to choose and implement an approach that matches the students' developmental level may result in students feeling uninterested, bored and having difficulty understanding the subject matter (Esah Sulaiman, 2003). A study by Ain Nur Atika Agus (2021) found that the issue with implementing the differentiated teaching approach in the Malay language subject stems from some teachers' preference for traditional methods. Traditional methods such as "chalk and talk" are considered outdated and no longer relevant today as they are teacher-centered and follow a one-way

learning model. Modern teachers should be open to accepting changes and improvements suggested by the MOE to enhance the quality of teaching that suits the diverse needs of students in the classroom.

The use of teacher-centered methods and reliance solely on textbooks as the main resource in teaching should be replaced with diverse, engaging teaching aids tailored to students' varied cognitive levels (Mior Muhammad Saiful, 2018). This is because the traditional method can limit students' mastery of the Malay language due to differing learning tendencies among them. This is supported by Halida Jawan and Zamri Mahamod (2021), who stated that the choice of teaching methods plays a crucial role in maximizing the ability of high-performing students and bridging cognitive gaps for weaker students. When teaching remains teacher-centered, students are denied the opportunity to fully express their learning preferences. Therefore, teachers must transition from traditional methods to differentiated learning so that the approaches used are aligned with students' abilities and backgrounds, ultimately achieving planned teaching objectives (Syahida Nadia Zakaria, 2015).

As such, teachers must move in tandem with the policies and plans formulated by the MOE because this significant task cannot be carried out unless the driving agents implement it. Today's education system views teachers as key figures in schools who shape and ensure students actively participate in learning so that no student is left behind. Since students learn differently, teachers must understand their tendencies to deliver information effectively during teaching. Students' varied interests and comprehension levels can sometimes affect the success of a teacher's teaching. Thus, selecting the right teaching strategy can encompass all levels of student intelligence during classroom activities. Differentiated learning is one of the methods that can and should be applied by Malay language teachers to address student diversity in the learning process.

B. Lack of Teacher Knowledge and Ideas

To plan and implement effective and quality teaching and learning, teachers must have appropriate knowledge and ideas to carry out the concept of differentiated learning in the classroom (Ain Nur Atika Agus, 2021). Teachers' knowledge of the concept of differentiated learning in Malaysia's education system must be widely disseminated because it highlights the existing diversity among students after the practice of class segregation was discontinued. This diversity demands that teachers today apply differentiated learning to meet the needs of all students in mastering language skills outlined in the Malay Language Standard Curriculum and Assessment Document (DSKP). Teachers must seek references and engage in discussions to broaden their knowledge and generate ideas for implementing differentiated learning. Without effort to obtain information about this concept, issues will arise during its classroom application.

The issue of knowledge in implementing differentiated learning in Malay language can be seen in the study by Danial Ariff Abdul Muttalip (2020), which found that Malay language teachers in rural category 3 schools had low knowledge of differentiated learning. This is also supported by a study by Mazura Sulaiman and Wok W C (2018), which found that 80 percent of school teachers lacked extensive knowledge about differentiated learning. This indicates that teachers are still not adequately exposed to information about differentiated learning. This happens because the practice is still in the moderate stage due to a lack of optimal exposure to teachers. Furthermore, teachers are often not provided with the appropriate courses and training to improve their teaching quality. The lack of knowledge also contributes to teachers' unpreparedness to implement differentiated learning, as it involves various student capabilities in a shared learning space.

Teachers' weak knowledge levels will affect the success of differentiated learning. This reinforces the perception that the approach is not widely practiced or highlighted in the education system because of uninformed teachers. Although many teachers acknowledge student diversity, they still do not apply differentiated pedagogy in classrooms. However, some teachers implement differentiated learning unknowingly by setting different objectives for students to achieve by the end of a lesson. Due to limited understanding, they are unaware they are already practicing the approach in addressing students of varying cognitive levels. Therefore, teachers should realize that using various teaching methods tailored to students' diversity is in fact referred to as differentiated learning.

C. Insufficient Time

Creating a holistic learning environment requires detailed planning that involves student learning outcomes (Suleyman, 2019). A teacher's ability to implement well-organized differentiated learning can lead to meaningful learning. However, time constraints often become a major challenge in implementing differentiated learning for students with varied levels. This is supported by a study by Nur Hanisah Radi and Syawal Amran (2023), which stated that time is the main challenge teachers face when planning and implementing differentiated learning. This is because the approach requires careful planning to meet every student's needs. Due to other work demands, teachers struggle to allocate time for preparing different teaching materials and planning differentiated content. Limited class hours also prevent teachers from conducting varied activities, resulting in a one-size-fits-all approach that is ineffective for all students.

This is also supported by Mohd Ikhwan and Azlina (2019), who found that teachers lack time for differentiated teaching due to being burdened with tasks outside their core teaching duties. The workload involving clerical tasks and documentation prevents teachers from preparing suitable and engaging teaching aids. When teaching materials fail to meet students' needs, lesson content becomes ineffective, as students struggle to understand it. Therefore, administrative support in providing relevant teaching materials and guidance can save teachers time and allow effective implementation of differentiated learning according to students' needs and preferences.

D. Difficulty in Obtaining Teaching Materials and Resources

Differentiated learning holds great potential to diversify students' learning styles based on their preferences and optimize their abilities. However, the challenge of obtaining teaching materials and resources hinders the successful implementation of this method. A study by Danial Arif Abdul Muttalip (2020) reported that Malay language teachers face difficulty in executing differentiated learning due to a lack of ideas and resources suitable for diverse student needs. Teachers' limited creativity in finding comprehensive teaching resources often results in them applying the method only to some students using available resources. Teaching materials must accommodate various learning styles such as auditory, visual, verbal and kinesthetic. Hence, differentiated learning is still rarely applied by Malay language teachers due to the difficulty in preparing such resources.

This is supported by a study by Nur Hanisah Radi and Syawal Amran (2023), which found that primary school teachers in Muar also faced challenges in sourcing relevant materials for differentiated learning. The lack of ideas for creating teaching materials is a major challenge that consumes teachers' time and affects lesson delivery. This may lead to fatigue and compromised teaching quality. Additionally, when students encounter irrelevant or unengaging materials, they lose interest and motivation to understand lessons they perceive as difficult.

E. Classroom Overcrowding

A high number of students in a classroom is a common issue in implementing differentiated learning in Malay language teaching. A study by Zuraidah Abdul et al. (2023) found that classroom overcrowding complicates differentiated instruction. This is because the method requires teachers to understand students' individual tendencies and abilities to plan effective and engaging lessons. With large class sizes, teachers may overlook individual student potential, contradicting the principles of equity and fairness in differentiated learning. Additionally, managing activities like group discussions becomes harder in cramped classrooms (Ocampo, 2018).

Nur Hanisah Radi and Syawal Amran (2023) also identified overcrowded classrooms as one of the most common challenges faced by teachers in implementing differentiated learning. A large number of students makes it difficult for teachers to give sufficient attention, and students at average or lower levels may feel neglected. Furthermore, lack of space limits the implementation of interactive activities and group work. Overcrowding also raises discipline issues if teachers are unable to manage behavior, disrupting the teaching process.

In conclusion, classroom overcrowding is a frequent challenge for teachers using the differentiated learning approach. Alivernini et al. (2019) stated that students' psychological well-being is better in smaller classes compared to larger ones. Overcrowding affects not only academic achievement but also teachers' ability to plan and execute lessons effectively. Therefore, this issue must be addressed to enable comprehensive student evaluation and the planning of suitable interventions to meet diverse educational needs in Malay language learning.

Theories and Models Used

To implement effective differentiated learning, teachers must first recognize that each student possesses unique differences. These differences include strengths, needs and preferences. According to Meyer et al. (2014), no individual is ordinary or average. Instead, each person has a range of abilities, strengths and tendencies that are dynamic and change based on their development. In today's modern world, technology can be used to develop a comprehensive and flexible curriculum that supports learning for students with various needs and interests (Meyer and Rose, 2005). Therefore, to better discuss the use of AI technology in differentiated learning, the Universal Design for Learning Framework and Technological Pedagogical Content Knowledge (TPACK) are used as the foundation for this discussion.

A. Universal Design for Learning (UDL) Framework

The Universal Design for Learning (UDL) framework is a guideline that can be used to develop an inclusive and comprehensive learning environment in the classroom. The UDL framework emphasizes that it is the curriculum that should be adapted by the teacher, not the individual student. This is because each individual naturally has unique characteristics such as strengths, interests, and preferences. Therefore, the UDL framework emphasizes three key principles that can serve as a guide for teachers in developing learning materials that meet the needs of Differentiated Learning. This is in line with the view of Kavita Rao (2021), who states that most elements found in UDL align with strategies often used by teachers in Differentiated Learning.

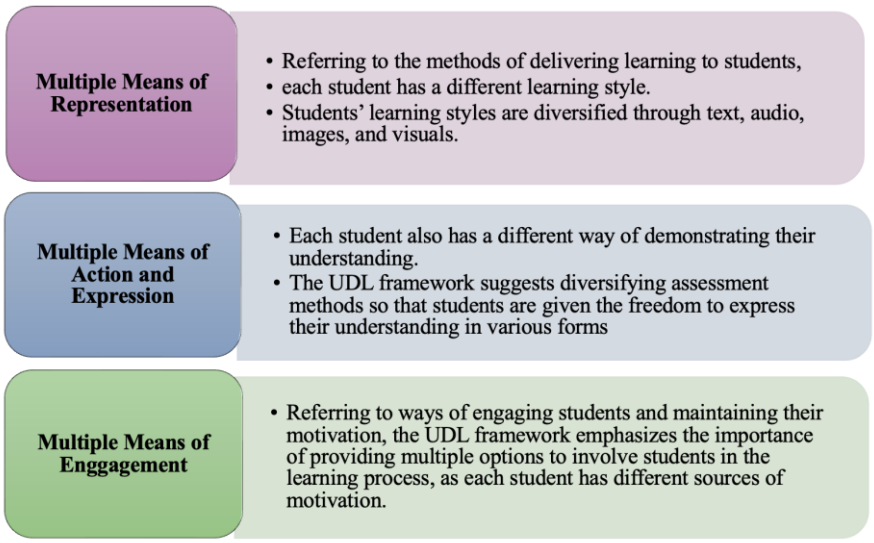

Figure 1: Principles of the Universal Design for Learning (UDL) Framework

Figure 1 illustrates the breakdown of UDL principles that teachers need to understand in order to create effective learning materials for Differentiated Learning. According to Kavita Rao (2021), one of the important aspects in the UDL framework is that teachers must identify barriers in the curriculum and the teaching and learning process, and then reduce those barriers by building effective learning supports for all types of learners. These learning supports may include the use of technology such as AI, which has become one of the current teaching aids. Kavita Rao also states in her writing that many features of the digital learning environment align with the UDL framework because they offer teachers a variety of options for presentation, action, expression, and student engagement.

The first principle of UDL is Multiple Means of Representation. A good teacher must strive to diversify the ways in which teaching and learning is delivered in order to meet the interests and needs of students. Among the teacher's responsibilities is to provide information through visual, auditory, and various other interactive media formats. This diversity in delivery is very important to maintain students' interest and motivation in learning. Therefore, technology is an ideal tool for enabling various means of presentation. However, it must be understood that teachers are not expected to provide instruction that meets each and every need of individual students. This is because individual learning systems are systematic and predictable. Thus, teachers can make informed predictions about students' learning styles by offering a few different instructional styles to support student needs (Kavita Rao and Grace Meo, 2016). These diverse teaching styles act as supports for students' learning, ultimately leading to active engagement in teaching and learning activities.

The second principle of UDL is Multiple Means of Action and Expression. This principle focuses on providing students with multiple ways to express themselves, respond to learning, and demonstrate understanding. This is because researchers of the UDL framework agree that every student has different capabilities in planning and completing tasks, which reflects their varied interests in engaging in the learning process. Therefore, the UDL framework strongly encourages teachers to provide diverse opportunities for students to express themselves, for example through writing, drawing, video production, and presentations. As such, UDL encourages teachers to offer various forms of assessment to allow students the freedom and space to demonstrate understanding in ways that reflect their preferences and abilities. These methods of self-expression should initially be guided by the teacher. For example, teachers may provide sentence starters, speech text templates, and ongoing practice. Later, teachers are encouraged to train students to assess their own abilities and strengths. In doing so, students will become more responsible for their own learning and will be able to develop self-identity and improve their academic performance.

The third principle of UDL is Multiple Means of Engagement. This principle highlights the need for teachers to identify students' emotions, motivation, and interests when planning Differentiated Learning. Providing students with multiple options for engagement in teaching and learning activities helps them sustain interest and effort. Among the recommendations of the UDL framework to promote active engagement is to allow students to make choices in their learning to maintain curiosity. For example, students can be allowed to choose the topic for their learning project. Additionally, teachers are encouraged to integrate current learning with real-world contexts. This ensures that classroom learning is meaningful and relatable to students' real-life experiences. This approach makes students more excited about learning and helps maintain their interest in the process. Teachers are also encouraged to carry out collaborative teaching and learning activities. This gives students the opportunity to learn cooperatively and share ideas with peers in the same group. Collaborative learning is more engaging than conservative methods because students and peers can work together to achieve learning goals. As a result, a positive learning environment can be created, leading to a more enjoyable classroom experience.

In conclusion, the Universal Design for Learning (UDL) is a highly suitable framework for teachers to use as a guide in planning Differentiated Learning. This is because the framework provides teachers with a clear understanding of what should be considered when implementing Differentiated Learning in classrooms with students of varying abilities and levels. From this understanding of content, teachers must integrate it with technological knowledge in education using the Technological Pedagogical Content Knowledge (TPACK) framework to ensure that the use of AI in Differentiated Learning is effective and appropriate to the needs of the classroom.

B. Technological Pedagogical Content Knowledge (TPACK)

Since the rapid advancement of AI technology, teachers' pedagogical approaches are also required to adapt quickly. This is due to the many benefits offered by AI technology in the field of education. However, it must be understood that AI technology serves as a complement to teaching, not as a replacement for the teacher's role. Teachers need to be equipped with adequate AI-based technological knowledge and pedagogical knowledge to prepare themselves for the next wave of technological change. Therefore, in response to this need, the Technological Pedagogical Content Knowledge (TPACK) framework will be used to discuss the integration of pedagogical knowledge and AI technology knowledge for teachers today.

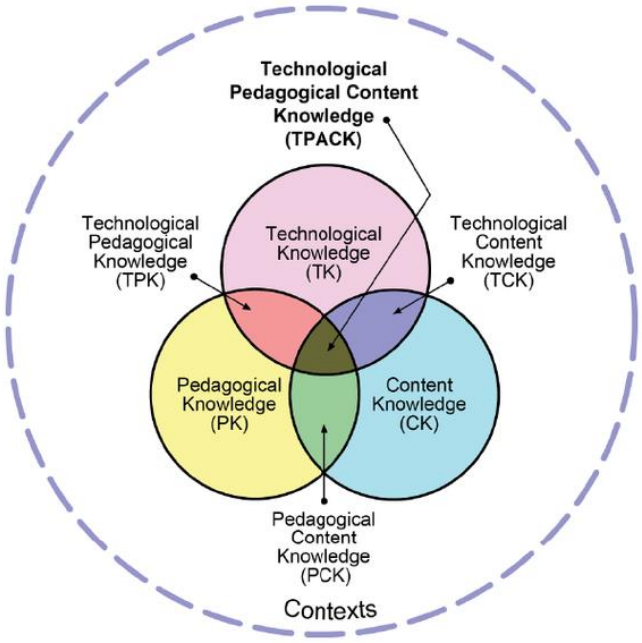

Figure 2: Technological Pedagogical and Content Knowledge (TPACK) Model

Source: Mishra & Koehler (2006)

Generally, the TPACK framework is a model that describes how to integrate content, pedagogy and technology domains in teaching and learning. The TPACK framework was developed by Mishra and Koehler in 2006 with the aim of providing teachers with a clear understanding that each knowledge domain must be effectively combined, rather than being mastered and implemented separately. The TPACK framework is flexible because it allows researchers to use it with any type of technology, including AI applications in teaching, while applying diverse pedagogical strategies. According to Mishra and Koehler, there are three main types of knowledge that every teacher must understand: Technological Knowledge (TK), Pedagogical Knowledge (PK) and Content Knowledge (CK). When these three areas of knowledge intersect, the combined knowledge can support a more effective digital learning environment.

The first domain in the TPACK model is Content Knowledge. Content Knowledge refers to the extent of a teacher's understanding of the subject matter being taught to students. For example, a Malay language teacher must have strong comprehension and mastery of grammar topics such as prepositions, compound words and others. Deep understanding of teaching content will help the teacher feel more confident during the teaching and learning process in the classroom.

The second domain is Pedagogical Knowledge. This refers to the teacher's mastery of instructional strategies, lesson planning and classroom management. Pedagogical knowledge is essential for every teacher. Therefore, pedagogical skills are emphasized in teacher training to prepare future educators for real classroom settings.

The third domain is Technological Knowledge. This includes a teacher’s understanding of current technological tools and systems that are suitable for teaching. A teacher must be able to identify and apply relevant technologies confidently in teaching and learning. Moreover, teachers should know how to use technology effectively according to students’ learning needs.

The fourth to seventh domains in the TPACK model are basic domains that emerge from intersections between the core domains. The fourth domain is Technological Pedagogical Knowledge (TPK), which is the intersection of technology and pedagogy. TPK is essential for teachers to effectively use AI to conduct engaging classroom activities. AI can also be used by teachers to help manage student discipline during lessons.

The fifth domain is Technological Content Knowledge (TCK), which combines technology and content. Teachers with TCK can use AI technology effectively to generate better teaching content. For example, a

teacher may use an application like ChatGPT, which is an AI tool, to generate various essay examples for students' reference.

The sixth domain is Pedagogical Content Knowledge (PCK), which is the result of combining pedagogy and content. Most teachers across different age groups possess PCK because both pedagogy and content are fundamental knowledge areas required for effective teaching. However, as time passes, the PCK that relies on traditional teaching methods has become outdated and less relevant.

Therefore, in line with technological developments, the element of technology must be emphasized in the integration of pedagogy and content in classrooms through the TPACK domain, which stands for Technological Pedagogical Content Knowledge. This domain is the primary focus in shaping teachers for the modern technological era. With TPACK knowledge, teachers can plan teaching and learning more effectively for their students. This is because teachers will be able to use AI technology by selecting effective applications to design learning activities that cater to students of various levels and interests within a single classroom. In addition, TPACK knowledge enables teachers to utilize AI for tasks such as grading papers, assessing students and analyzing student performance to develop better future curricular.

In summary, the UDL and TPACK frameworks are both crucial in supporting our understanding of the use of technology in teaching and learning, especially for differentiated learning. The UDL framework ensures that AI technology used in the classroom meets the diverse learning needs of students, while the TPACK framework ensures that differentiated learning is implemented effectively through the integration of technological, content and pedagogical knowledge.

Suggested Solution to the Issue of Differentiated Learning in the Teaching and Facilitation (T&L) of the Malay Language Using Artificial Intelligence (AI)

A. Teachers Still Tend to Use Traditional Methods

As previously discussed in earlier subtopics, there are still teachers who tend to use traditional methods to teach students in the classroom, such as the chalk and talk method. This method remains a preferred choice for some teachers because they are less aware of current pedagogical developments and believe that it is an easier and faster way to deliver content. As a result, AI technology offers a solution with its capability to provide suggestions for engaging teaching and learning (T&L) activities for teachers. For instance, teachers can use AI applications such as ChatGPT, Gemini AI, Copilot, and Claude to generate suggestions for interesting and appropriate activities that align with the topic being taught and cater to the diverse proficiency levels of students in the classroom. The teacher does this by entering a detailed prompt into the application, such as "Suggest a T&L activity involving movement for the topic of prepositions for Year 3 students with low, medium, and high ability." Based on this prompt, the AI applications will generate relevant suggestions to guide teachers in planning and implementing effective classroom instruction.

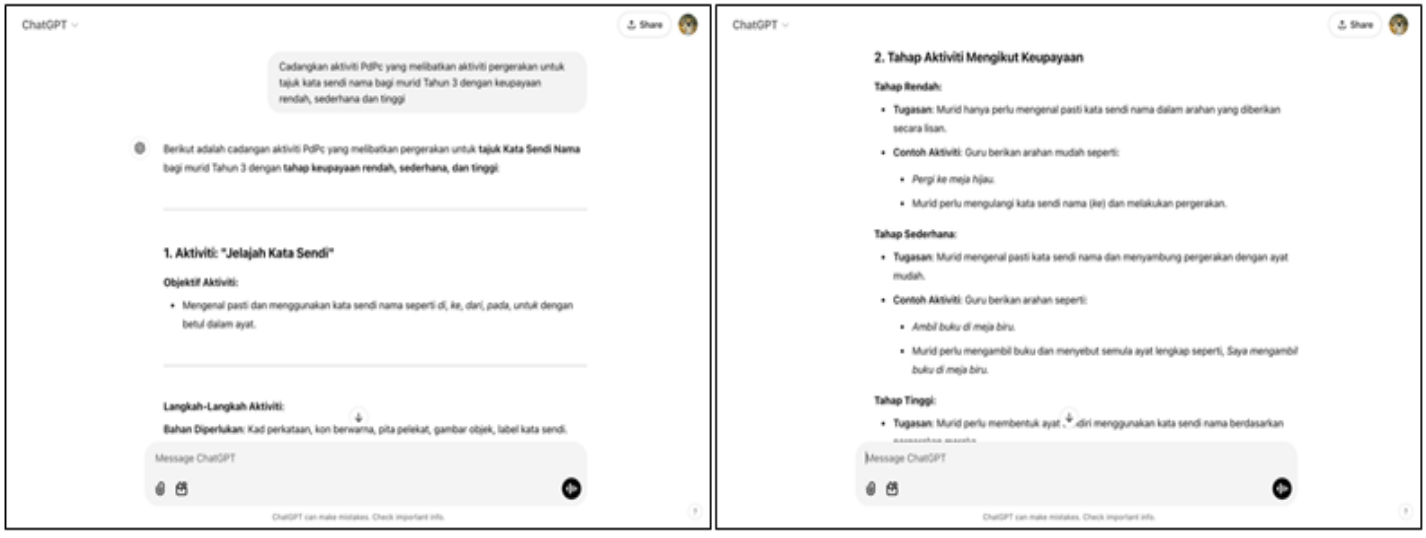

Figure 3: Actual display of suggestions generated by the ChatGPT application based on the given prompt

The suggestions generated by AI ensure that the teacher's teaching and learning (T&L) activities are engaging and suitable for students of low, medium, and high proficiency levels. This aligns with the principles of the Universal Design for Learning (UDL) framework, specifically the principle of Multiple Means of Engagement, which refers to the varying levels of students in allowing them to participate in T&L activities. As a result, students will feel more motivated and enjoy participating in these activities because they feel that their needs are being given due attention by the teacher.

A recent study entitled *"Exploring Differentiated Instruction in College English Teaching in the Context of ChatGPT (2025)"* demonstrates the potential of ChatGPT in facilitating differentiated learning. Through case analysis, the study found that ChatGPT generates content tailored to individual learner needs such as language level, learning style, and interests and dynamically adjusts learning pathways. The system is also capable of providing real-time adaptive feedback and resource recommendations. Importantly, these capabilities significantly enhanced student engagement and educational outcomes in diverse classrooms. Such findings offer strong empirical support for integrating ChatGPT within differentiated pedagogical approaches.

B. Lack of Teachers' Knowledge and Ideas

According to Shampa Iftakhar (2016), younger teachers are seen to be more skilled in handling technology compared to senior teachers who are less proficient in using it. As a result, although senior teachers have been in the service longer than younger teachers, they tend to maintain traditional teaching methods that are becoming less relevant. This is due to the fact that senior teachers explore new technologies less frequently on their own. Consequently, there are still teachers who use less interactive and engaging learning materials, such as writing notes on the board. Therefore, AI offers a solution by helping teachers prepare interactive learning materials automatically. For instance, teachers can use AI features in applications like Kahoot and Quizziz to generate quiz questions related to the topic of Adjectives for Year 2.

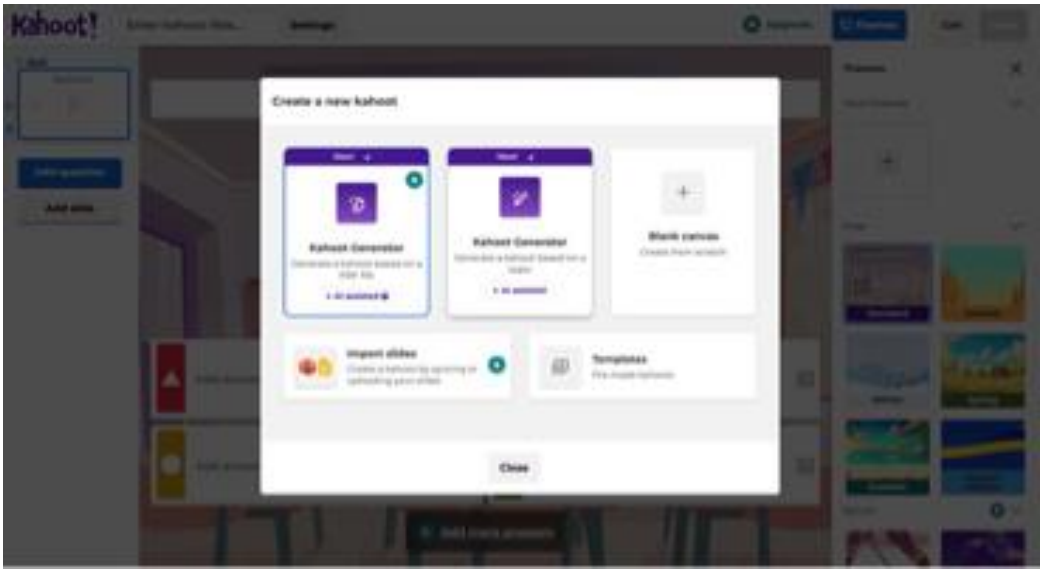

Figure 4: Kahoot with AI features capable of generating questions automatically

The use of Kahoot quizzes in the classroom makes teaching and learning more interesting and interactive. This is because students can express their understanding through various forms of quiz games rather than only completing exercises in their books. This approach is in line with the UDL framework recommendation, specifically the principle of Multiple Means of Action and Expression, which highlights that each student has different ways of expressing their understanding. As a result, students with various abilities and preferences become more active in the classroom, compared to traditional note-copying activities from the whiteboard.

A recent empirical study titled *"Assessing the Effectiveness of Using Kahoot! to Improve Students' Engagement during Grammar Lessons (2025)"* found that the integration of Kahoot in ESL grammar instruction significantly enhanced students' engagement, attitudes, and academic performance. The mixed-method approach revealed that students perceived the platform as highly useful and easy to use, while qualitative

interviews supported the findings with evidence of increased classroom participation and enjoyment in learning.

Furthermore, a comparative study involving 76 fourth-grade primary students, in *"Comparing Science Success Of Primary School Students In The Gamified Learning Environment Via Kahoot And Quizziz (2019)"* demonstrated that gamified learning using Kahoot and Quizizz significantly improved cognitive achievement and multidimensional engagement including behavioral, cognitive, and agentic aspects. These effects were particularly prominent in classrooms employing indirect instructional strategies, which are commonly aligned with differentiated pedagogy. Together, these findings suggest that AI-driven gamified platforms like Kahoot and Quizizz can play a meaningful role in supporting more engaging and differentiated learning experiences.

C. Insufficient Time

Teachers' workload nowadays is not limited to teaching alone but also includes various non-teaching responsibilities such as co-curricular activities, filing, sports, and more (Fatin Imanina & Anuar Ahmad, 2024). Due to this, the time available for teachers to focus on their core teaching duty is reduced, leaving them with insufficient time to prepare diverse and engaging teaching materials. As a result, students lose motivation to engage in lessons that follow the same pattern every day. Therefore, AI technology is seen as a solution to the issue of limited teacher time. There are various AI-supported applications that teachers can use to generate interactive media teaching materials. One such example is Canva Education. As the name suggests, Canva Education is specially designed for individuals in the education field, particularly teachers, to create various teaching materials that emphasize visuals, graphics, and audio.

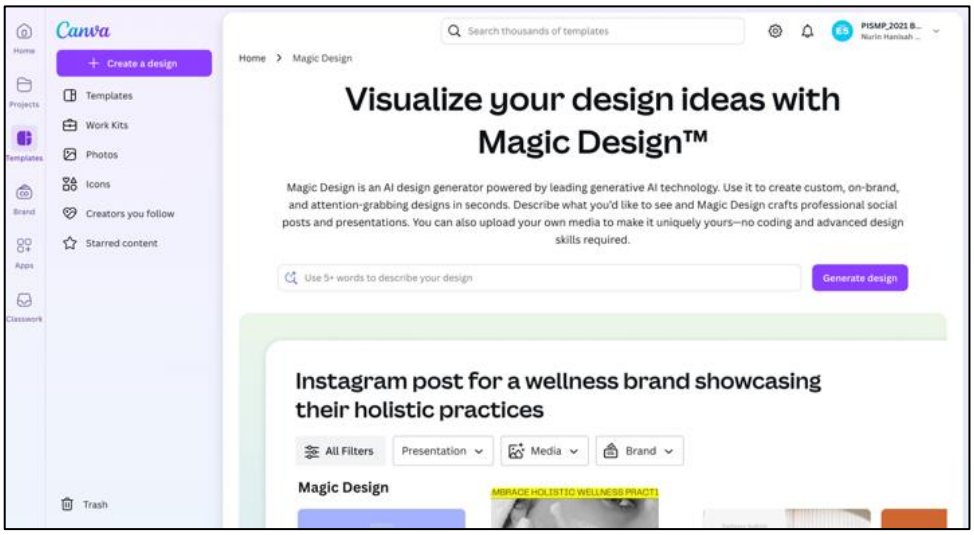

Figure 5: Canva Education with AI features capable of generating engaging teaching slides

Teachers can save time by using AI support in Canva Education to create teaching slides that incorporate graphics, visuals, and audio. Compared to the use of static textbooks, the interactive slides produced by AI in Canva Education are better because they meet students' learning needs, as they are generally more attracted to and understand better with graphic-based materials. For example, the topic of Classifiers is easier to understand with graphic materials that show the use of words such as 'sebuah' for large objects and 'sebilah' for sharp items. This approach aligns with the principle of Multiple Means of Representation in the UDL framework, which supports teachers in implementing Differentiated Learning in the classroom. As a result, students will be more focused during lessons, ultimately creating a more engaging and enjoyable learning environment for them.

A recent empirical study titled *"Differentiated Learning Using Canva: A Strategy for Enhancing Motivation and Learning Outcomes in Science Education (2024)*" found that using Canva to create visual learning media significantly improved student motivation and cognitive performance. The study applied differentiated instruction strategies by designing media tailored to various student needs such as visual animations, interactive slides, which resulted in increased engagement and learning outcomes. Quantitative findings

indicated substantial motivation gains and enhanced comprehension, while qualitative feedback highlighted that students responded more actively when interacting with Canva-based materials. These results offer strong empirical support for leveraging Canva's AI-powered design tools to help teachers efficiently develop differentiated teaching materials

D. Lack of Teaching Materials and Resources

The effort by the Ministry of Education Malaysia to broaden the horizon of education through a thematic approach in each subject is commendable. However, this initiative has somewhat burdened teachers with the task of preparing materials that align with both the topic and the designated theme. For example, in the Year 3 Malay Language textbook, the topic of question words is placed under the theme of Safety. Most Malay Language teachers tend to teach only the main topic without integrating the appropriate theme due to the lack of teaching materials and resources beyond textbooks and workbooks. Therefore, AI applications can overcome this issue by generating a variety of teaching materials that meet the specific needs of the teaching and learning (TnL) process. For instance, using AI applications such as Udio, SUNO, and Jukedeck, teachers can now create songs for teaching purposes.

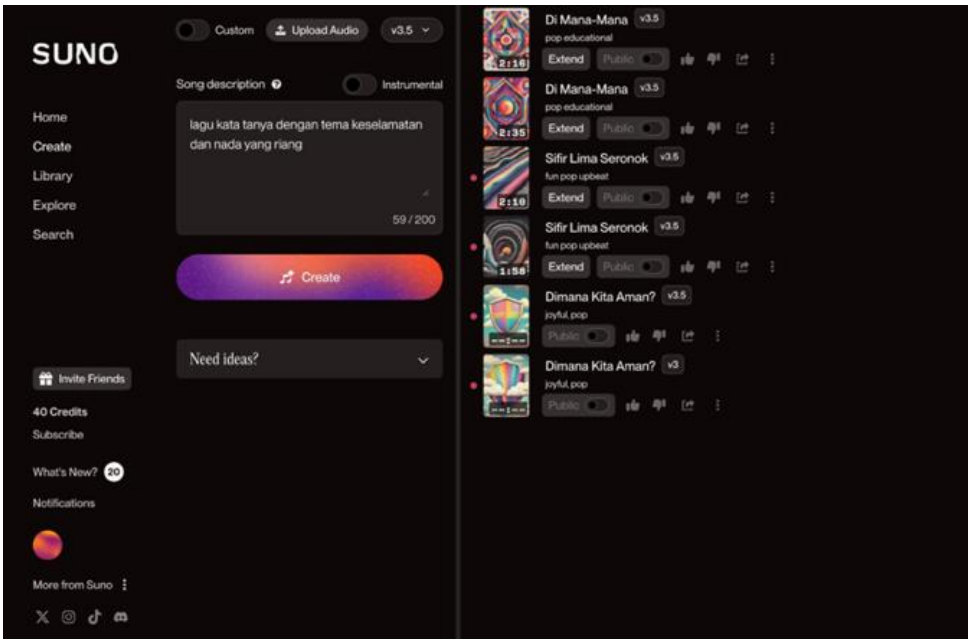

Figure 6: The Suno application is capable of generating fun learning songs based on the given prompt.

The AI-generated songs can save time and effort for teachers who would otherwise have to create their own TnL materials that align with the topic and theme according to the Curriculum and Assessment Standard Document (DSKP). Teachers can use these songs to help students remember the learning content through group singing activities. Singing is a form of edutainment activity that is highly encouraged in the classroom because it caters to students' interests, especially those with musical inclinations. Furthermore, teachers are also following the UDL framework's recommendations, particularly the principles of Multiple Means of Representation and Multiple Means of Engagement, which emphasize the teacher's responsibility to deliver content in various formats and the need to consider students' interest levels in participation.

E. Overpopulated Classrooms

It is undeniable that a high number of students in one classroom limits the teacher's ability to identify the potential and capabilities of each student. As a result, teachers often conduct lessons without considering students' individual strengths and tendencies. Hence, the ever-evolving AI technology is said to be capable of addressing this issue. One solution is implementing AI cameras in classrooms to monitor students' performance and behavior. The use of AI technology in smart classrooms has been expanding in China over the past few years. One of the AI models used is the Region-based Convolutional Neural Network (R-CNN) (Zhang et al., 2024).

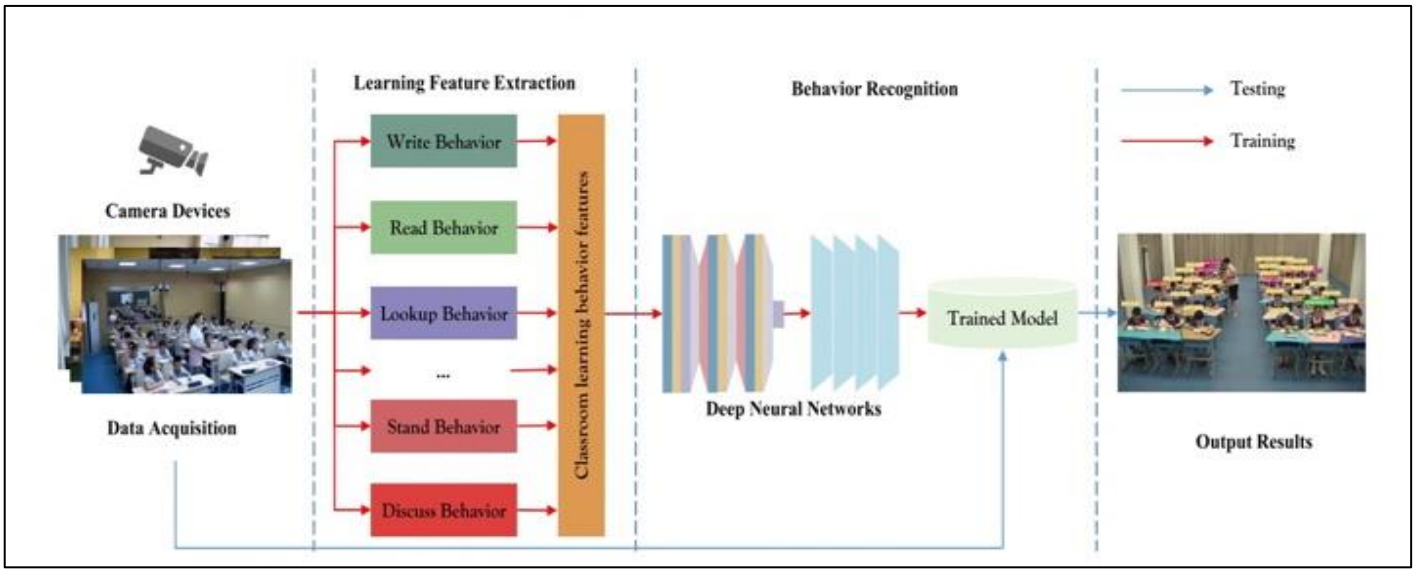

Figure 7: The process of student behavior recognition in R-CNN.

Figure 7 illustrates the behavior recognition process carried out by the R-CNN AI camera. R-CNN is equipped with deep learning features that can recognize objects and faces, enabling it to identify student behaviors in the classroom. The behavioral data collected is then categorized into reading behavior, writing behavior, character behavior, standing behavior, and discussion behavior. From this data, R-CNN builds algorithms (patterns) to analyze and produce outputs such as student behavior reports (Dianqing Bao, 2023). These reports allow teachers to identify students' potentials and tendencies even in overcrowded classrooms. Moreover, the data collected by the AI can also be used to predict students' future performance and suggest suitable activities that teachers can implement to help improve their outcomes. In a real-life example within the Malay Language classroom, the AI camera can recognize student behaviors such as speaking, reading, and writing, which are core language skills outlined in the Malay Language DSKP. Based on these behavior patterns, the teacher can assess each student’s language skill proficiency, even if the large number of students initially made individual monitoring difficult. The teacher can then plan targeted interventions such as speaking practice for students who are found to be struggling to reach the expected standard. Through the use of AI cameras, the teacher has effectively applied the UDL framework's principle of Multiple Means of Engagement by striving to understand each student’s level and needs and implementing appropriate interventions to enhance their language skills.

In conclusion, AI technology indeed offers numerous benefits to the education community, especially teachers in implementing Differentiated Instruction in Malay Language teaching. With various intelligent features, AI can support teachers and cater to students with different levels, interests, and tendencies. However, it is undeniable that there are still many challenges in the current education system and school infrastructure that need to be addressed to truly realize the implementation of AI in Differentiated Instruction for Malay Language. Additionally, all stakeholders in the education system must be well-prepared for the potential threats that come with the convenience of AI technology. Therefore, the next subtopic will discuss the positive and negative implications of using AI in Differentiated Instruction for Malay Language based on different education stakeholders.

Positive Implications of Using Artificial Intelligence in Planning Differentiated Learning

Implementing AI in Differentiated Learning requires synergy among all education stakeholders. To ensure that the integration of AI into Malay Language Differentiated Learning is effective and sustainable, significant changes will involve both policymakers and practitioners. Since the integration of AI in this context is not yet established domestically as it is abroad, comprehensive attention is essential.

A. Ministry of Education Malaysia (MOE)

With the adoption of AI in Differentiated Malay Language Learning, the Ministry must be proactive in developing strategic plans and policies to ensure that this cultural shift achieves its objectives. MOE should

establish a dedicated team of specialists experienced in AI and Differentiated Learning to champion its implementation in Malay Language education. They also need to allocate appropriate budgets for infrastructure access and maintenance such as laptops, tablets, or connectivity especially in rural schools. One major benefit is that real-time AI-generated data on Differentiated Learning can replace manual teacher reports. This data allows MOE to forecast potential risks and inform long-term planning. Therefore, AI can significantly enhance data analysis capacity, while strategic planning and infrastructure readiness remain key. Equally important, the Ministry must establish clear ethical guidelines to ensure the responsible use of AI particularly in protecting student data privacy, preventing algorithmic bias, and maintaining equity in access to AI-based tools across diverse school settings.

B. State Education Department (JPN)

MOE's strategic plans can only succeed with cooperation from the JPN at each state level. The JPN is responsible for overseeing the implementation of MOE policies locally. They must ensure that Malay Language teachers are well-equipped to use AI in Differentiated Learning. With AI support, JPN can more accurately identify schools with low Malay Language performance and allocate targeted training and infrastructure support. AI enables large-scale data analysis across schools, allowing resources to be allocated quickly and efficiently.

C. District Education Office (PPD)

Under JPN authority, District Education Offices (PPD) are responsible for implementing MOE strategies locally. To mainstream AI in Differentiated Malay Language Learning, PPD must provide training and support to teachers on AI-based lesson planning. This includes training on AI tools and guidance modules. PPD should also monitor the performance of teachers and students who require assistance by using analytical insights. Ultimately, PPD plays a critical role in supporting MOE and JPN in implementing AI-based Differentiated Learning at the district level.

D. Schools

The integration of AI in Differentiated Learning has a direct impact on schools. Schools must regularly organize in-house training on AI integration in Malay Language teaching since this is still new for many educators. Trainings may be held at the department level or in cross-department collaborations, such as sharing methods for automatically generating educational songs using AI. Schools must also monitor how Malay Language teachers implement Differentiated Learning to ensure alignment with goals and objectives. Regular observation helps identify strengths and challenges in AI adoption at the school level.

E. Teachers

Teachers who use AI to support Differentiated Malay Language Learning experience notable positive effects on the quality of their work. AI helps teachers plan differentiated lessons based on student needs, reducing overall workload. It also helps in identifying behavioral patterns and analyzing student progression, even in large classes. AI can detect students' proficiency and learning tendencies through exercise responses and real-time observations. As a result, teachers can better manage their time and focus on planning lessons tailored to students' level and variety. Teachers must continue upgrading their AI skills and share expertise with colleagues to raise overall teaching effectiveness and student achievement.

F. Students

In the educational ecosystem, students are regarded as the clients of teachers, schools, and MOE. Any policy or practice implemented impacts them directly. With AI-integrated Differentiated Learning, students gain more meaningful learning experiences aligned with their needs and interests. AI can generate personalized suggestions and predict classroom challenges, enabling teachers to plan more effective lessons. AI-based tools like interactive quizzes (e.g., Kahoot) increase engagement among tech-savvy youth who are already familiar with technology. In this way, AI supports more meaningful learning and increases student motivation in Malay Language lessons.

Implications and Negative Effects of Using Artificial Intelligence (AI) in Planning Differentiated Learning

It is undeniable that AI technology provides numerous benefits to its users. However, as responsible users, we must also acknowledge that the advantages of AI come with threats that can lead to negative implications in the field of education. Therefore, this subtopic will explain the implications and negative effects of using AI in planning differentiated learning based on the stakeholders in the education sector.

A. Ministry of Education Malaysia (MOE)

The expansion of AI functions in education means there will be a large-scale digitalization of data storage related to students and teachers. This is intended to facilitate AI technology in analyzing recorded data to produce the outputs needed by its users. However, important data stored digitally faces risks of leakage if not managed properly and if awareness of data security is low (Ulven and Wangen, 2021). In fact, data breaches have occurred in countries that have widely implemented AI in education, such as the case at Arden University involving the data of 44,000 students (Jin Li et al., 2023). Additionally, the implementation of AI in differentiated learning could lead to overdependence by MOE on AI technology. Excessive reliance on AI in decision-making could result in actions that do not align with current realities and lead to more problems.

B. State Education Departments (JPN) and District Education Offices (PPD)

The effectiveness of AI use in differentiated learning depends on teachers' readiness to use the technology. This readiness is influenced by training provided by key parties such as JPN and PPD, which requires a skilled workforce to conduct the training. However, research by Shahidah Hamzah (2024) states that one of the challenges in the education sector during the Fourth Industrial Revolution (IR4.0) is the lack of skilled personnel to manage such technologies, including AI. The shortage of skilled workers means that AI-related training cannot be provided as intended, causing the planned AI integration in differentiated learning to become chaotic. In terms of evaluation, the use of AI can also lead to imbalanced assessments among schools due to technological infrastructure gaps. Currently, basic infrastructure in rural areas is still insufficient, let alone infrastructure for high-capacity technologies. In contrast, schools in urban areas with adequate technology face no issues implementing AI in their differentiated Malay Language learning. Therefore, one clear negative implication of AI use in differentiated learning is that it leads to unbalanced and biased school evaluations.

C. Schools

Regular maintenance is one of the challenges of using technology, ensuring that tools remain functional over time. However, one negative implication of this is that technology maintenance often incurs high costs, placing a burden on schools. This is especially true for publicly used technologies like computers in school labs. As a result, technology tools are often left unmaintained, eventually becoming damaged and unusable. According to Abdul Rahman et al. (2022), the lack of facilities and poorly maintained equipment leads teachers to avoid using technology-based teaching approaches. This situation can derail long-term strategic plans involving technology like AI that have been outlined by MOE, leaving them abandoned or only partially implemented. Therefore, it is evident that dependence on technology to access AI burdens schools with long-term maintenance responsibilities.

D. Teachers

The use of AI in differentiated Malay Language learning demands that teachers enhance their technological skills and knowledge. However, this expectation can become burdensome, particularly for veteran teachers who are less exposed to technology compared to millennial-generation teachers. Moreover, current conditions already show that teachers are overwhelmed with multiple responsibilities, including clerical tasks, co-curricular duties, and other commitments outside the classroom (Fatin Imanina and Anuar Ahmad, 2024). As a result, any new initiative in education directly impacts teachers, who must attend various training programs to adapt to digital tools, potentially leading to psychological stress and reduced motivation (Poobalan and

Mahmud, 2022). This stress is even more pronounced when teachers face technical issues during teaching sessions. This is supported by Mohd Amin and Cheiw (2014), who state that fear and lack of confidence in using new technology often stem from inadequate knowledge in handling unexpected technical problems. Therefore, it is clear that the use of AI in differentiated learning increases teacher workload and psychological stress as they adapt to new technological demands.

CONCLUSION

In conclusion, differentiated learning is indeed essential during teaching and learning sessions to ensure that students' needs are consistently addressed. As the years pass, technological development has accelerated, culminating in the creation of Artificial Intelligence or AI as a tool to ease human tasks. In reality, AI not only assists in daily life but can also be beneficial in education, particularly in Malay Language instruction. However, along with these advancements come threats and challenges that accompany the convenience and benefits offered by AI. Therefore, key stakeholders in education, such as MOE, must be prepared to face these technological challenges while maximizing AI's benefits for current educational needs. It is hoped that this writing will serve as a guide in the formulation of policies related to AI use in today's education, especially in differentiated learning. It is also hoped that future researchers will continue to expand studies on the role of AI in education.

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