

Generative AI in the Special Education Integration Programme (PPKI): Parents' Understanding of Cognitive and Creative Support in English Learning

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ABSTRACT

This study examines the digital literacy of parents whose children are enrolled in the Special Education Integration Programme (Program Pendidikan Khas Integrasi, PPKI) and investigates their awareness of the potential of generative artificial intelligence (GenAI) to support cognitive and creative aspects of English language learning at home. Employing a quantitative approach, the research utilizes a descriptive survey design grounded in Bandura's Social Cognitive Theory. The sample comprises 200 parents from five primary schools in the Sentul area of Kuala Lumpur. Data were collected through a structured questionnaire and analysed using descriptive statistics, Pearson correlation, and multiple regression in SPSS. The results indicate that parents possess a moderate level of digital literacy in using GenAI tools, leading to the rejection of the first hypothesis (H01), which anticipated a high literacy level. Inferential analyses demonstrate a strong positive correlation between parents' digital literacy and their knowledge of GenAI's cognitive support. Additionally, a strong predictive relationship was identified for creative aspects, resulting in the acceptance of H02 and H03. These findings confirm that digital literacy is a significant predictor of parents' capacity to utilize GenAI for special education at home. Although access to technology is present, the Ministry of Education and schools should develop targeted AI-literacy training modules for these parents. With appropriate training, parents can transition from passive technology users to active facilitators of learning, thereby fostering a more inclusive and seamless digital learning environment for Students with Special Education Needs (Murid Berkeperluan Pendidikan Khas, MBPK).

Keywords: PPKI, Generative AI, Parents' understanding, Cognitive, Creative, English learning

INTRODUCTION

The Special Education Integration Program (PPKI) has an important role to play in ensuring that Students with Special Education Needs (MBPK) in Malaysia have equitable, inclusive and appropriate learning opportunities. As Dzulkifli and Fakhruddin (2024) point out, MBPK are given access to formal education via the PPKI stream from the primary school level on the basis of the Special Education curriculum. In the case of English language teaching, MBPK usually encounter difficulties in reading, in understanding instructions, in mastering vocabulary and in maintaining their attention during Teaching and Facilitation (Pengajaran dan Pemudahcaraan, PdPC) sessions. Madrin (2020) stresses that reading skills are a basic element of learning since they involve connecting visual symbols with sounds in order for students to understand the meaning. Nevertheless, the development of these skills is often limited by differences in levels of understanding, working memory and information-processing abilities. As a result, PPKI students need a more flexible, multimodal, visually supported and repetition-based PdPC approach in order to meet the needs of learners with a variety of learning profiles, such as those with learning disabilities, attention deficit hyperactivity disorder, autism spectrum disorder or other developmental delays.

In order to maintain this systematic approach beyond the classroom, Su (2024) states that parents have an important role to play in helping their children with their learning at home, although they frequently encounter time limitations, a lack of confidence in English, and inadequate knowledge of suitable methods of guidance. As part of the process of digital transformation, Generative Artificial Intelligence (GenAI) has appeared as a learning tool which has the possibility of aiding the English language development of PPKI students by means of features such as simplified explanations, adaptive exercises, visual content, interactivity, and audio support (Farhah et al., 2025). These features not only enable students to understand the information in a clearer and more structured way but also have the capacity to encourage creativity by means of activities like constructing simple dialogues, creating short stories, exploring ideas, and producing visual materials connected with language learning (Elkot et al., 2025). As a result, learning can become more suitable for students, more engaging, and easier for parents to keep an eye on. At the same time, the extent to which parents understand the potential of GenAI, especially in supporting the cognitive and creative parts of their children's learning which has not been adequately established (Kumas & Yildirim, 2024). On this point, digital literacy becomes an essential prerequisite that determines whether parents can safely, meaningfully, and in a way appropriate to their children's learning needs, access, evaluate, and make use of AI-generated content (Druga et al., 2022). Furthermore, the use of learning materials that include clear visual, audio, graphic, and colour elements can further improve students' understanding by presenting objects, sounds, and concepts in a more concrete way during everyday learning activities (Chear & Norman, 2024). Lastly, in keeping with technological development and the Ministry of Education's promotion of digital integration in PdPc, the need to investigate parents' level of understanding, their digital literacy, and their confidence in using GenAI to support the English learning of PPKI students has become increasingly important and warrants scholarly attention.

LITERATURE REVIEW

Taking into account both the technological and domestic situation, it must be acknowledged that even though the educational technology sector is still developing, there are serious concerns about its effectiveness in the context of learning at home. There are important questions to be asked about how well parents are prepared, confident, and capable of helping Students with Special Education Needs (MBPK), especially those in the Special Education Integration Programme (PPKI) stream, to use GenAI-based learning technologies (Alali et al., 2024). The situation becomes even more complicated when English is being learned as a second language, since this often leads to worries about the students' real learning progress and their development of language skills (Yunus et al., 2020). If parents do not have adequate pedagogical knowledge and access to adaptive learning resources, they may feel uncertain and frustrated, which in turn disrupts the continuity of their children's learning at home (Manan & Yamat, 2021). Although GenAI has the potential to act as a supportive tool that enhances parents' roles, its effectiveness is not only determined by cognitive factors, people's attitudes, and the surrounding environment, but also by parents' understanding of how the technology can support the cognitive and creative aspects of their children's English language learning. For this reason, there is a pressing need to investigate how parents' digital literacy and self-confidence affect their understanding of the role of GenAI in supporting the cognitive and creative parts of English language learning among PPKI students at home.

English Learning Needs and Challenges Among PPKI Students

The study of English among MBPK students is highly context-dependent, since it requires a more concrete, accessible, and multimodal approach to teaching. These students, who are at a disadvantage, often have difficulties with processing information that is not stable, particularly when PdPc relies too heavily on abstract verbal explanations without enough visual aid. In order to deal with this important problem, existing literature shows that visual and audiovisual materials act as essential anchors for understanding. They help the students to connect abstract language forms with concrete references and situations, thus allowing them to understand second-language input much more effectively (Hairia'an & Dzainudin, 2020). This teaching approach is especially important for students who depend greatly on visual stimulation in order to help them maintain their attention over time, to interpret complex instructions accurately, and to improve their understanding of vocabulary, including hearing-impaired students and those who need visual perceptual support (Yasin & Mohamad, 2024). In this regard, the use of visual, auditory, and kinaesthetic methods provides a complete

pedagogical framework that is in line with the particular cognitive characteristics of MBPK. Hence, the current educational literature clearly shows that visual and multimodal strategies must be regarded as basic conditions if the process of learning English is to remain meaningful and highly accessible for PPKI students.

Starting from this assumption, the difficulty that students at PPKI have when learning English usually arises at the most basic level of literacy, namely, the fundamental capacity to read, write, and understand the relationship between sounds and written words. For MBPK students, these ongoing difficulties are specific and deeply rooted obstacles to effective communication and the processing of cognitive information. The inherent weaknesses they possess are closely linked to serious limitations in working memory and in their ability to process phonological information, which severely hampers their ability to store and process linguistic information while reading, especially impacting those who have disorders such as dyslexia (Anchak et al., 2023). As a result, people with such neurocognitive profiles find it extremely hard to deal with conventional instructional materials that are heavy on text. Moreover, the specific impairments in phonological processing directly hinder the step-by-step development of reading skills and the long-term retention of vocabulary, which in turn disrupts the entire process of second language acquisition (Snowling, 2013). The fact that these particular neurocognitive limitations exist makes it clear why parents now urgently need adaptive digital media tools at home; since traditional textbooks alone are fundamentally inadequate, GenAI becomes an essential technological means for instantly translating texts into accessible visual formats and simpler versions.

In order to overcome these important cognitive difficulties, educational researchers often recommend the use of multisensory methods, as they offer the vulnerable students more than one way of processing complex language information. Teachers can enable students to build up linguistic meaning on the basis of concrete, hands-on experiences rather than depending solely on abstract activities that involve reading (Supriatna & Ediyanto, 2021). The effectiveness of this practical approach is supported by the fact that student engagement rises considerably when manipulative materials and practical exercises are used, which in turn allows basic language concepts to be developed step by step and in a secure manner (Byrne & Ramchandani, 2022). It is necessary to employ highly individualised strategies for different categories of disability; for example, the sight word technique has been found to be very effective with students who have Down syndrome. Even though these students generally have serious difficulties with phonetic spelling, they are able to recognise whole-word forms when they receive consistent training with repeated visual support (Othman et al., 2023). Finally, this evidence clearly shows that achieving success in learning English at PPKI does not depend on adopting a one-size-fits-all approach, but instead requires the ability to carefully match instructional strategies to the individual characteristics of each student.

Generative AI in Special and Inclusive Education

Generative Artificial Intelligence, often referred to as GenAI, is a sophisticated technology which is able to create very original content - including text, images, audio, and interactive replies by means of complex data patterns. In the wider field of education, this impressive innovation has attracted a rapidly growing amount of attention. As Zhai (2022) points out, GenAI has great potential for offering learning experiences that are not only much more flexible but also highly responsive and deeply personalised for students who have very different learning needs. When looking at the case of PPKI, the main pedagogical advantage of GenAI is its capacity to dynamically alter the language level, the mode of delivery, and the structure of the instructional activities in response to the particular requirements of vulnerable learners. In order to deal with this particular feature, GenAI can easily generate simplified instructions, graded vocabulary exercises, and highly contextual visual materials that directly help students with special needs to understand the content (Omosunlade, 2025). Moreover, because of this remarkable technological possibility, GenAI becomes an exceptionally appropriate and strong support for learning English, especially for those students who need structured repetition and materials that are cognitively friendly. In the end, GenAI should be seen not just as a technological trend but as a vital pedagogical tool that supports highly accessible continuous learning.

The present research stresses that the integration of GenAI should be seen as part of the broader framework of twenty-first-century learning. This framework places a strong emphasis on digital literacy, critical thinking, and the responsible use of technology as a key element of the PdPc process. Dwivedi et al. (2023) state that the

use of modern technology should not be viewed simply as the basic ability to operate devices, but also as a more advanced cognitive skill involving the selection of relevant information, the critical assessment of its accuracy, and the use of technology for truly meaningful educational purposes. For special needs students in PPKI, this aspect of digital literacy is particularly important since technology has the potential to act as a powerful helper in greatly reducing the ongoing gap in access to adaptive and multimodal learning resources. This transformative view is supported by the fact that artificial intelligence can effectively facilitate highly individualised learning and intensive repeated practice—things which are very difficult to deliver consistently in typical, overcrowded inclusive classrooms (Kasneci et al., 2023; Baidoo-Anu & Ansah, 2023). Yet these beneficial changes in teaching approach do not happen automatically, and therefore the misuse of technology without adequate digital literacy may lead to passive use.

When it comes to home-based learning, generative AI has great potential from a educational point of view in enabling parents to act as highly effective learning facilitators. This kind of support is especially important in cases where parents need to help their children carry on with continuous practice of the English language but often do not have enough command of the language themselves or sufficient preparation time. By making smart use of generative AI, parents will be able to quickly produce simple daily exercises, create sentence examples in context, prepare specific revision questions, and get highly personalised suggestions for interactive activities that exactly suit the child's present stage of development (Dwivedi et al., 2023). This kind of immediate technological assistance has the potential to greatly boost parents' sense of self-efficacy since they are given a powerful aid that can start and keep up meaningful learning interactions at home. Yet Chiu et al. (2023) strongly stress that the extent to which this digital support is effective depends greatly on the parents' basic digital literacy. In particular, parents have to be able to give clear instructional prompts that are precisely suited to the student's cognitive level and must avoid making inputs that are too general, as these lead to educational responses that are highly irrelevant. As a result, some form of structured guidance for parents is still necessary.

Parents' Understanding of Cognitive Support in English Learning

When considering PPKI, the cognitive development of MBPK in the study of English should not be seen simply as a matter of the students having a disability, but it also has to be understood in relation to the degree to which practice at home is carried out in a structured, repetitive, and consistent way. The literature indicates that the continuation of practice outside of school is important for helping students keep what they have learned, develop a more solid understanding, and apply their skills in everyday situations (Chavez et al., 2023). For MBPK, this need is even more important since their cognitive and language development usually depends on structure, repetition, and continuous reinforcement in order to form stronger schemas of meaning (Murshidi et al., 2023). If there are no consistent practice routines—such as revising vocabulary, carrying out short reinforcement activities, and having scheduled guidance—then the learning that takes place at school is likely to amount to nothing more than temporary exposure and will be easily forgotten. Hence, within the PPKI framework, the quality of support provided at home must be regarded as a factor that either strengthens or weakens the students' cognitive development. As a result, parents' understanding of their children's cognitive development becomes a fundamental basis for making sure that English practice at home genuinely extends the school-based intervention in a meaningful manner.

Moreover, because parents are anxious about their own English language skills, the kind of help they give at home tends to be limited. In a great many cases, they only keep an eye on what their children are doing without actually encouraging understanding, asking questions, or offering reinforcement in a way that promotes the child's cognitive development. It has been shown in the literature that this kind of anxiety can decrease parents' readiness to take an active part in giving learning guidance, especially if the topic is seen as difficult or if it requires particular skills (Yusuf et al., 2024). In such a case, GenAI can help close the gap in competence by explaining the material in simpler terms, dividing the tasks into small steps, and recommending exercises that are properly graded for the abilities of MBPK (Pesovski et al., 2024). With this kind of support, parents are able to move from a passive to a more engaging role when guiding their children. However, the extent to which this is effective still relies on parents' capacity to judge whether the output generated is genuinely suitable to the child's level and needs. It therefore follows that parents need to understand cognitive

development not just in terms of spending time with their children while they learn, but in terms of being able to judge what level of support the child actually requires.

The cognitive development of MBPK also relies on regular monitoring since minor, recurring weaknesses may turn into serious barriers to the development of later language skills. In this regard, parents with digital literacy could make use of AI-based tools to record patterns in their child's responses, detect specific weaknesses, and assess which kinds of practice are more effective over time (Barua et al., 2022). Such monitoring is important since it allows home practice to be more targeted rather than just involving general repetition without a clear aim. At the same time, the information gathered from parental observation can help to align the strategies used at home with those at school, thus reinforcing the collaboration which is very important in the context of PPKI (Devadas, 2025). GenAI can likewise help to ensure consistency in practice by producing flexible sets of activities that can be carried out in accordance with the child's daily routine. Hence, parents' understanding of cognitive development should not be limited to general knowledge of their child but should instead include the ability to observe patterns of progress, identify suitable methods and techniques, and adjust the practice in light of the feedback received during the learning process.

Parents' Understanding of Creative Approaches to English Learning

A major difficulty that parents often encounter is having few ideas when planning learning activities suitable to the needs of MBPK. Even if their intention to help the child is strong, shortcomings in terms of time, ideas, and experience in preparing learning materials usually result in inconsistent home support (Evtushenko et al., 2025). In such a case, GenAI can act as a helper by immediately producing suggestions for activities, which can then be altered to suit the child's particular skill areas, such as vocabulary practice, picture-word matching, spelling games, or more concrete comprehension exercises (Mittal et al., 2024). This ability to adapt helps parents to avoid relying on fixed materials which might no longer correspond to the child's rate of development. Moreover, GenAI also enables the creation of visual teaching aids like flashcards, illustrations, and picture-based worksheets, even if the parents do not have specific design skills (Cho et al., 2025). Hence, in this situation, parents' creativity should be seen as the capacity to make use of technological assistance in turning their limitations regarding ideas and skills into the production of materials that are more consistent, interesting, and appropriate to MBPK's English learning in PPKI.

Home learning can also turn mechanical if parents place excessive importance on repeated practice without including some enjoyment or variety. As a result, MBPK is likely to tire quickly, lose concentration, and show resistance to the learning sessions even if the practice is carried out regularly (Murray et al., 2024). Under these circumstances, entertaining educational methods such as singing, storytelling, mini theatre, role play and dramatic activities become important since they present language practice as a more relaxed experience while at the same time supporting repetition and the reinforcement of vocabulary (Kurniawan & Wulandari, 2025). GenAI helps in carrying out this approach by producing story scripts, short dialogues and simple lyrics that can be used immediately in everyday routines, thus lowering the barrier for parents when starting such activities from the beginning (Cho et al., 2025). Moreover, a stimulating home environment — for example, an organized reading corner, easily accessible materials and stable micro-routines — also enhances the effectiveness of these creative activities (Tong et al., 2021). Therefore, parents' creativity should be seen as their ability to combine entertaining elements, positive emotions and a favourable home structure in order to keep MBPK's English practice routines going within the context of PPKI.

In present-day home realities, gadget use among MBPK is often passive in nature, such as watching content without interaction or receiving one-way language input. This pattern of use reduces opportunities for language practice that is active, meaningful, and truly stimulates thinking and language production (Law, 2024). Therefore, parents' creativity is needed to restructure screen time into more interactive and productive activities. Through GenAI, parents can invite children to produce digital artefacts such as flashcards, vocabulary maps, short dialogues, or shared stories that require active involvement in choosing words, constructing meaning, and giving responses (Guan et al., 2024). Activities such as this help shift the child's role from passive consumer to active creator, thereby giving higher pedagogical value to the use of existing technology. In addition, interactive support can also strengthen students' self-regulation when activities are

arranged in small steps that can be repeated and monitored (Jiang et al., 2025). Thus, in the context of PPKI, parents' creativity should be argued as the ability to transform gadget use from passive consumption into active creation that supports English learning in a more functional way.

Key Constructs and Theoretical Framework

Social Cognitive Theory (SCT) is used to understand human learning and action through a reciprocal relationship among three main components, namely personal factors, environment and behaviour (Bandura, 2001). This triadic relationship points out that learning is not a linear or solitary process but is influenced by the continuous interaction between an individual's beliefs and abilities, the learning environment, and the actions taken by the individual. Based on Figure 1, this study adapts the SCT theoretical framework to explain the interaction between parents' digital literacy as a personal factor and the GenAI-supported home learning environment and parents' learning support behaviours. This interaction serves as the theoretical foundation for studying the relationship between parents' digital literacy and their understanding of the potential of GenAI to aid the cognitive and creative aspects of English learning among Students with Special Education Needs (MBPK) in the Special Education Integration Programme (PPKI).

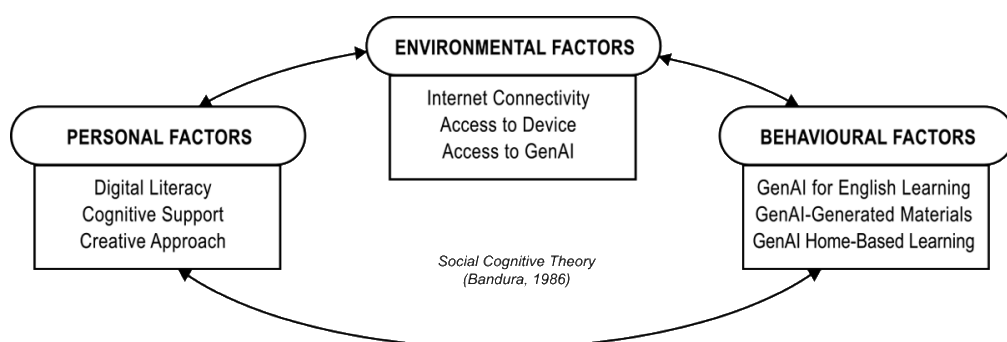


Figure 1. Theoretical Framework of Parents' GenAI Understanding in PPKI English Learning

This theoretical framework applies Social Cognitive Theory to explain parents' understanding and use of Generative AI (GenAI) in supporting English learning among PPKI students. The personal factors comprise parents' digital literacy and their understanding of GenAI's potential for cognitive support and creative learning. Digital literacy refers to parents' ability to access, operate, evaluate, and safely use GenAI applications (Tang et al., 2026). Cognitive support concerns their understanding of how GenAI may facilitate vocabulary acquisition, comprehension, memory, attention, and structured learning, whereas creative potential relates to storytelling, imagination, dialogue construction, and original language expression (Al-Khresheh et al., 2026). The environmental factors include internet connectivity and access to digital devices and GenAI applications, which create the technological conditions necessary for parents to engage with GenAI.

The way in which parents apply their knowledge and make use of the technological resources available to them involves the development of learning practices, such as using Generative AI for learning English, adapting materials that are generated by AI, and organising home-based activities. In line with the SCT principle of triadic reciprocal determinism, the personal, environmental and behavioural factors influence each other continuously (Bandura, 1999). For instance, having access to appropriate devices might lead parents to improve their digital literacy, while a higher level of digital literacy would in turn enable them to recognise the cognitive and creative capabilities of GenAI and to make meaningful use of it at home. Yet since the study mainly focuses on parents' digital literacy and understanding, the environmental and behavioural aspects should be seen as part of the wider theoretical background rather than as variables that were directly tested in the statistical analysis.

METHODOLOGY

This study employs a descriptive survey research design, as it is well-suited to obtaining a comprehensive overview of parents' digital literacy levels and their understanding of how to use GenAI to support English

learning at home. Through the survey method, data can be collected from the target respondents using a questionnaire developed based on the main constructs of the study, namely digital literacy, understanding of cognitive aspects, and understanding of creative aspects. The population of a study is the total target group that has the characteristics consistent with the study's purpose. In this study, the population is the parents of Students with Special Educational Needs (MBPK) who are registered in the Special Education Integration Programme (PPKI) at five selected primary schools under the District Education Office Sentul, Kuala Lumpur. The schools involved are i) Sekolah Kebangsaan Lelaki Jalan Batu, ii) Sekolah Kebangsaan Perempuan Jalan Batu, iii) Sekolah Kebangsaan Taman Koperasi Polis, iv) Sekolah Kebangsaan (1) Batu 4 Jalan Ipoh and v) Sekolah Kebangsaan Sentul Utama.

A preliminary estimate shows that each school has about 80 PPKI students from Year 1 to Year 6. Thus, the total number of PPKI students in the five schools is estimated at 400. Since this study has parents as respondents, one parent or guardian is selected to represent each student. Therefore, the estimated total study population is 400 parents. After identifying the population, the minimum sample size for a given population is determined using Krejcie and Morgan (1970), which determines the minimum number of respondents as the sample size of 196 respondents. However, in order to reduce the risk of incomplete or non-returned questionnaires, the researcher intends to distribute questionnaires to a sample of about 200 persons. The table is used to find out the sample size that is large enough to be representative of the population and to allow more reliable data analysis (Krejcie & Morgan, 1970). Hence, the choice of the sampling technique and the way of determining the sample size are appropriate for the quantitative research design used in this study.

Questionnaire Development

The questionnaire was developed by reviewing and adapting existing studies which dealt with Social Cognitive Theory, digital literacy, the use of generative AI in education, parental involvement, and technology-supported learning. It was divided into four sections. Section A gathered information about the respondents' demographic and technological backgrounds, such as their gender, age, level of education, occupation, access to digital devices, previous experience with generative AI applications, and whether or not they had a subscription to paid generative AI services. The generative AI applications were grouped into several categories: general AI assistants, image generation, video generation, audio and voice AI, writing and content creation. These questions served to establish the respondents' level of technological access and their prior exposure to generative AI, thus reflecting the environmental context as outlined in Social Cognitive Theory.

Sections B, C and D each included six statements which were adapted from the relevant literature and tailored to the situation of parents of pupils at PPKI. Section B evaluated the parents' digital literacy in relation to the use of GenAI, covering prompt writing as well as the creation of text, visual, audio, simulation and interactive learning materials. Section C measured the parents' understanding of the way in which GenAI could provide cognitive support in the process of learning English through vocabulary, grammar, visual explanations, progressive exercises, reading comprehension and multimedia materials. Section D looked at their understanding of the creative potential of GenAI through storytelling, dialogue construction, image generation, role-play, audio and digital video activities. Together, the questions assessed the parents' technological abilities and their understanding of how GenAI could support the cognitive and creative aspects of home-based English learning for pupils at PPKI.

Reliability Test

Table 1. Reliability Analysis of Research Instruments Based on Pilot Study Data

Domain	N	Reliability, α
Parents' Digital Literacy	6	.966
Understanding of the Cognitive Aspect	6	.979
Understanding of the Creative Aspect	6	.982

Based on Table 1 above, the internal consistency of the three research domains was assessed using Cronbach's alpha values based on a pilot test involving 30 respondents. The findings show that all domains demonstrated a

very high level of reliability. The domain of Parents' Digital Literacy in Handling GenAI, which consisted of six items, recorded an excellent reliability value ($\alpha = .966$). Next, the domain of Understanding the Potential of GenAI in Supporting the Cognitive Aspects of English Language Learning also showed a very high level of reliability ($\alpha = .979$). Meanwhile, the domain of Understanding the Potential of GenAI in Supporting the Creative Aspects of English Language Learning recorded a Cronbach's alpha value of $\alpha = .982$. According to Taber (2017), a high Cronbach's alpha value indicates that the items in an instrument have a strong level of internal consistency. Therefore, all items in the three research domains can be considered to have good reliability and are suitable to be retained for the actual study.

Validity Test

Table 2. Validity test of Pilot test (N=30)

Domain	KMO	Interpretation	Barlett	Significant	Interpretation
Parents' Digital Literacy	.825	Meritorious	217.606	<.001	Significant
Understanding of the Cognitive Aspect	.839	Meritorious	305.175	<.001	Significant
Understanding of the Creative Aspect	.841	Meritorious	342.502	<.001	Significant

Note. KMO = Kaiser-Meyer-Olkin Measure of Sampling Adequacy. Bartlett's Test of Sphericity is significant when $p < .05$.

The results of Bartlett's Test of Sphericity for all three domains were significant. The domain of Parents' Digital Literacy recorded a Bartlett's Test value of 217.606, the Cognitive Understanding domain recorded a value of 305.175, while the Creative Understanding domain recorded a value of 342.502, with a significance value of $p < .001$. A significant Bartlett's Test result indicates that the correlation matrix among the items was not an identity matrix. This shows that the items in each domain had sufficient relationships to support the assessment of construct validity (Shrestha, 2021; Hasim et al., 2024). In this context, the findings suggest that the items in each domain had an adequate inter-item relationship and were suitable for assessing the constructs established in this study. These findings are consistent with the view that instrument validation through EFA can help researchers identify item suitability, strengthen construct validity, and ensure that the developed instrument has a stronger psychometric foundation before being used in the main study (Chan & Idris, 2017; Mannan et al., 2025).

Normality Test

Table 3. Normality Assessment for Each Research Domain

Domain	N	Mean	Standard Deviation	Skewness	Kurtosis
Parents' Digital Literacy	30	2.772	1.194	-.242	-1.269
Understanding of the Cognitive Aspect	30	3.250	1.099	-.185	-1.057
Understanding of the Creative Aspect	30	3.088	1.215	-.223	-1.211

Based on Table 3 above, the normality of the three research domains was assessed based on skewness and kurtosis values using pilot test data involving 30 respondents. The use of skewness and kurtosis values is one of the common approaches in quantitative research to assess the shape of the data distribution and identify the possibility of data normality (Hopkins & Weeks, 1990; Cain et al., 2016). The results showed that the skewness values of the three domains were from -.185 to -.242, and the kurtosis values were from -1.269 to -1.057. Based on Hair et al. (2010) and Byrne (2010) data can be considered normally distributed with skewness values falling between -2 and +2 and kurtosis values falling between -7 and +7. Since all skewness and kurtosis values were within the acceptable range, the data in this study can be considered to have an approximately normal distribution. The conclusion also supports Orçan (2020) that skewness values can be used as a consideration to determine the acceptability of using parametric analysis. Hence, the data was consistent with the assumption of normality and suitable for further parametric analysis such as Pearson correlation analysis.

FINDINGS AND DISCUSSION

Parents' access to digital devices and patterns of GenAI use provide important insights into their readiness to support English learning among Students with Special Educational Needs (MBPK) in the Special Education Integration Programme (PPKI). The analysis covers access to digital devices, use of free and subscription-based GenAI services, and familiarity with text, image, writing, and video-generation applications. These findings help distinguish basic technological access and exposure from the digital literacy required to evaluate, adapt, and apply AI-generated materials according to the individual English-learning needs of MBPK.

Table 4. Parents' Digital Access and GenAI Usage Patterns

GenAI Paid Subscription	Frequency	Percent (%)
Yes	45	22.5
No	155	77.5
Total	200	100
Devices at home		
Smart Phone	180	90
Tablet	92	46.0
Laptop	125	62.5
Desktop	23	11.5
Smart Tv	130	65.0
No Devices	5	2.5
GenAI Assistants		
ChatGPT	188	94.0
Gemini	137	68.5
Microsoft Copilot	75	37.5
Claude	13	6.5
GenAI Image Generation		
Canva	169	84.5
DALL·E	36	18.0
Stable Diffusion	3	1.5
Leonardo AI	16	8.0
Midjourney	5	2.5
Never Use	29	14.5
GenAI Video Generation		
Runway ML	8	4.0
Pika	19	9.5
HeyGen	13	6.5
Never Use	176	88.0
GenAI Writing and Content Creation		
Jasper AI	8	4.0
Copy.ai	27	13.5
Writesonic	14	7.0
Grammarly	123	61.5
QuillBot	108	54.0
StealthWriter	4	2.0
Never Use	58	29.0

The results show that the respondents had good access to digital technology yet made limited use of paid generative AI services. Smartphones were the most commonly owned device, with 180 respondents (90.0%) reporting that they had them, then came smart TVs (65.0%), laptops (62.5%), tablets (46.0%), and finally desktop computers (11.5%). Even though there was such widespread access to these devices, 155 respondents

(77.5%) had not subscribed to paid generative AI applications, while only 45 (22.5%) used services that required a subscription. This points to the fact that parents generally favoured the free and easily accessible platforms since these were both affordable and practical. The free versions of applications such as ChatGPT and Canva might be enough to produce simple learning materials, visual aids, and other everyday learning activities for MBPK. However, having access to devices and applications does not mean that people have a high level of generative AI digital literacy, as such literacy also involves the necessary skills, knowledge, and confidence to use these resources in a meaningful way.

The fact that people preferred accessible platforms was also shown by the kinds of generative AI applications they used. ChatGPT was the most commonly used general-purpose application, being reported by 188 respondents (94.0%), then came Gemini (68.5%) and after that Microsoft Copilot (37.5%). With regard to visual content, Canva was used by 169 respondents (84.5%), which shows a preference for well-known and easy-to-use design platforms rather than specialised AI image generators. Likewise, Grammarly and QuillBot were the most frequently used writing-support tools, with 123 respondents (61.5%) and 108 respondents (54.0%) respectively reporting their use. These applications can assist parents in preparing visual materials, explaining vocabulary, improving sentence structure, checking grammar, and supporting basic English-writing activities. Yet, simply being familiar with templates and automated writing features does not mean that someone is able to create effective prompts, assess the generated content, or adapt the materials to the individual learning needs of MBPK.

On the other hand, GenAI video-generation tools were largely unknown, since 176 people (88.0%) stated that they had never used such applications. The low level of adoption could be due to the higher degree of technical skill required, the need for better internet connectivity, greater data usage, and the extra time needed to generate, edit, and customise video content. As a whole, the results show a steady decrease in usage as GenAI applications become more specialised and technically demanding: parents were very familiar with general text-based applications, moderately familiar with writing and visual-design tools, and considerably less experienced with video-generation platforms. Even though parents have good basic technological access, specific guidance is still needed to enable them to move on from using general applications to the critical, safe, and pedagogically appropriate use of GenAI for supporting English learning among MBPK at home.

Hypothesis based on Pearson correlation and regression interpretation

Table 5. H01 Testing Based on Descriptive Analysis

Hypothesis	Analysis	Result		Interpretation	Decision
		Mean	Standard deviation (SD)		
H01: The level of digital literacy among parents of PPKI students in handling Generative Artificial Intelligence (GenAI) applications is high	Descriptive analysis	3.269	.918	Medium level of parents' digital literacy	Rejected

Table 5 gives a summary of the H01 testing as a result of the descriptive analysis. H01 claimed that the level of digital literacy among the parents of PPKI students in relation to the use of GenAI applications would be high. The findings, however, showed that the mean score for Parents' Digital Literacy was 3.269 with a standard deviation of .918. According to the interpretation range adopted in this study, this score is in the moderate category. Hence, H01 was rejected since the results did not support the expectation of a high level of digital literacy among the participants. The rejection of H01 does not point to a weakness in the study but instead offers a valuable insight into the real situation of the parents. The results indicate that even though parents may have had some basic experience with digital tools and GenAI applications, their ability to use these technologies effectively, critically, and with confidence for educational purposes remains at a moderate level. In the context of helping with MBPK in English learning at home, this underscores the need for more

structured exposure, practical training, and ongoing guidance so that parents can make better use of GenAI applications as home-based learning support tools.

Table 6. Pearson Correlation Analysis on H02 and H03

Hypothesis	Analysis	Result		Interpretation	Decision
		R value	P value		
H02	Parents' digital literacy in handling GenAI → Parents' understanding of GenAI potential in supporting cognitive aspects of English learning	.908	<.001	Very strong positive correlation	Accepted
H03	Parents' digital literacy in handling GenAI → Parents' understanding of GenAI potential in supporting creative aspects of English learning	.842	<.001	Strong positive correlation	Accepted

Note. Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation analysis results for H02 and H03 are given in Table 6. With regard to H02, the results indicate a very strong, positive, and significant relationship between Parents' Digital Literacy and their Understanding of the Cognitive Aspect of GenAI use, the correlation being $r = .908$ and $p < .001$. As for H03, the results also reveal a strong, positive, and significant relationship between Parents' Digital Literacy and their Understanding of the Creative Aspect of GenAI use, the correlation in this case being $r = .842$ and $p < .001$. Because both of these relationships were found to be statistically significant, H02 and H03 are accepted. The findings imply that parents' digital literacy plays an important role in influencing their understanding of how GenAI can help MBPK students with their English learning at home. To put it simply, the more digital literacy skills parents have, the more likely they are to understand how GenAI can be used to meet both cognitive and creative learning needs. This means that GenAI should not be viewed merely as a general digital tool, but also as a possible educational support tool provided that parents have the appropriate skills, awareness, and guidance.

Table 7. Regression Analysis between Parents' Digital Literacy and Understanding of GenAI Potential

Hypothesis	Relationship	Regression Value		Regression Interpretation
		p value	R ²	
H02	Parental Digital Literacy → Understanding Cognitive Aspects	<.001	.825	Very strong predictive relationship
H03	Parental Digital Literacy → Understanding Creativity Aspects	<.001	.709	Very strong predictive relationship

The regression analysis results concerning the extent to which Parents' Digital Literacy predicts their understanding of GenAI's potential in supporting learning are given in Table 7. With regard to H02, the results indicate that Parents' Digital Literacy was a significant predictor of understanding the Cognitive Aspect, the p value being less than .001 and the R^2 equal to .825; this shows that digital literacy accounted for 82.5 per cent of the variance in the parents' understanding of the cognitive aspect. As for H03, Parents' Digital Literacy also proved to be a significant predictor of understanding the Creative Aspect, with $p < .001$ and $R^2 = .709$; this means that digital literacy explained 70.9 per cent of the variance in parents' understanding of the creative aspect. Hence, both predictive relationships were strong and statistically significant. The findings demonstrate

that parents' digital literacy is an important factor in determining the level to which they understand the potential of GenAI for providing home-based learning support. To put it simply, it is not sufficient for parents just to know that GenAI tools are available; they also need the skills and confidence to use these tools in a meaningful way. In the case of supporting MBPK in English learning at home, greater digital literacy can help parents to make more effective use of GenAI to meet both the cognitive and creative learning needs of their children. It follows that improving parents' digital literacy should be considered a key step in helping them incorporate GenAI into their children's learning in a more practical and useful manner.

Moderate Level of Parents' Digital Literacy

GenAI obtained an average score of 3.269, placing it in the moderate category. This result caused H01 to be rejected since parents' digital literacy did not achieve the higher level that was anticipated. The finding shows that even though parents have access to digital devices and have used a number of GenAI applications, their proficiency is still mainly confined to basic use. This result supports the view of Han et al. (2024), who stated that the adoption of GenAI by caregivers is still in its early phases, particularly because there is a lack of formal guidance to assist them in using the technology more broadly, a point also made by Kumas & Yildirim (2024), who found that families with children having special needs encounter particular difficulties in building their digital self-efficacy. In this situation, the time and opportunity that parents have for managing the needs of MBPK at home on a daily basis may prevent them from systematically exploring GenAI applications.

In addition, this moderate level of digital literacy suggests that parents still require more specific skills to use GenAI effectively for educational purposes. According to Gutierrez (2026), understanding how to construct effective instructions or prompts is important in reducing the risk of inaccurate AI-generated information. Without this skill, learning materials generated for MBPK may contain factual errors or may not be appropriate for the child's learning level. Walter (2024) also emphasised that prompt engineering has become an important component of modern digital literacy, while Bender (2024) viewed awareness of the capabilities and limitations of AI as part of contemporary educational literacy. Therefore, parents should not view GenAI merely as a tool to speed up daily tasks, but also as a learning support that can be adapted to their children's needs. Accordingly, targeted training and practical guidance are essential to help parents optimise the use of GenAI and strengthen inclusive collaboration between home and school (Chaidi et al., 2026; Liu et al., 2026).

Relationship Between Digital Literacy and Understanding of Cognitive Aspects

Pearson correlation and regression analyses showed a very strong, positive and significant relationship between parents' digital literacy and their understanding of the potential of GenAI in supporting the cognitive aspects of learning, $r = .908$, $p < .001$. In addition, regression analysis indicated that digital literacy was a significant predictor. The R^2 value was .825. This means that parents' digital literacy can account for 82.5% of the variance in understanding cognitive aspects. This result supports the acceptance of H02, meaning that the higher level of parents' digital literacy will lead to better understanding on how GenAI can be used to help their children learn cognitively at home. This is in line with the work of Delaney & Chen (2026) who underscored the importance of AI literacy skills in helping carers use technology more efficiently, and Xie et al. (2026) who claimed digital competence allows parents to navigate their children's self-directed learning environment more responsibly. Digital literacy in this context helps to move parents from passive users to more confident and informed learning facilitators.

This ability is important, because MBPK generally require more structured, clear and appropriate learning support according to their level of processing. When parents have good digital literacy, GenAI can be used for cognitive support, for example in summarising complex texts, explaining the meanings of words, building simple example sentences, or preparing learning materials that are more suitable for their children's abilities. Fan (2025) noted that scaffolding support can be helpful for students with working memory limitations and Mehta et al. (2025) stressed the importance of information visualisation and dual coding approaches in reducing the cognitive load. In addition, Van Garderen et al. (2025) propose that students with disabilities can be accommodated through the use of modified instructional materials. The finding, therefore, shows that digital literacy allows parents to apply GenAI technically and also enables them to repurpose the technology as

a more significant cognitive support tool for MBPK's English language learning at home (Li & Samah, 2025; Rappa et al., 2026).

Relationship Between Digital Literacy and Understanding of Creative Aspects

Pearson correlation and regression analysis revealed a strong, positive, and significant relationship between parents' digital literacy and their understanding of the possibilities of GenAI to foster the creative aspects of learning, $r = .842$, $p < .001$. Further, the regression analysis indicated that digital literacy has a significant predictive power with an R^2 of .709, i.e., 70.9% of variance in understanding creative aspects can be explained by the level of digital literacy of parents. Thus, H03 was accepted. This result confirms that the greater the digital competence of the parents, the greater their understanding of the ways GenAI can be used to support their children's creative learning at home. This finding is in line with Delaney & Chen (2026) who pointed out that AI literacy allows parents to better understand, assess and utilise technology in their children's learning process. Digital competence enables parents to use AI more responsibly in their children's self-directed learning environment, as further pointed out by Xie et al. (2026). In this research, digital literacy refers not only to the ability to operate applications but also to the ability to select suitable functions, build creative prompts, assess generated contents, and modify learning materials according to the interests and ability level of the child.

This ability is important because the English language learning in MBPK needs interesting, flexible, visual materials, and can be easily adapted to the individual learning style. Parents with good digital competence can use GenAI to generate simple short stories, digital flashcards, visual prompts, picture-based vocabulary exercises, simple dialogues, language games or creative activities that encourage children to engage with English in a more enjoyable way. According to Farhah et al. (2025), GenAI can provide more adaptive and personalised learning support to students with disabilities and Li & Samah (2025) stated that GenAI can support inclusive learning by offering more personal and interactive experiences. Rappa et al. (2026) also showed that the learning agency of students with disabilities can be supported by GenAI when the technology is used appropriately according to their needs. Therefore, the strong relationship between digital literacy and understanding of creative aspects in this study indicates that GenAI can only be used meaningfully if parents have the skills to guide, evaluate and transform the AI generated outputs into creative, easy to understand and suitable learning materials for MBPK at home.

CONCLUSIONS

The results indicate that it would be worthwhile creating specific AI-literacy programmes for the parents of students with Special Educational Needs (MBPK) as a result of cooperation between Malaysia's Ministry of Education, the schools and PPKI teachers. Since the parents showed only a moderate level of digital literacy, the training offered should go beyond just giving them basic knowledge of technology and should include practical abilities such as constructing prompts, verifying the content, adapting materials, protecting privacy and using generative AI in an ethical manner. Parents could be better helped in their use of tools such as ChatGPT, Canva and NotebookLM by means of short workshops, video tutorials, user-friendly guides, weekly examples of prompts and carefully selected lists of safe applications. This kind of support might change the way children use technology from simply passively consuming screens to taking part in guided activities which involve vocabulary exercises, digital flashcards, visual aids and language games tailored to their individual learning needs.

In general, the level of digital literacy among parents was found to be significantly linked to their understanding of the cognitive and creative capabilities of generative AI in the context of learning English. The results show that having access to devices and generative AI applications is not enough unless one has the ability to evaluate and properly apply the materials that are generated. Looking at this from the point of view of Social Cognitive Theory, parental digital literacy is a personal factor that functions within a technological environment and may thus influence the way learning is carried out at home. Yet since the study relied on parents' self-reported understanding rather than on their actual use of generative AI or on the learning outcomes of their children, it cannot establish that digital literacy has a direct effect on English achievement.

The study therefore stresses the importance of promoting an inclusive and ethical integration of generative AI, with ongoing collaboration between educational authorities, schools, parents, and technology developers.

Contributions of The Study

The study advances research in the field of special education by offering empirical evidence regarding the connection between parents' digital literacy and their perception of the way Generative AI could support the cognitive and creative aspects of English learning for students with special educational needs (MBPK). It goes beyond the current GenAI literature, which has mainly concentrated on ordinary students, teachers, and higher education, by considering parents as key facilitators of learning at home. Furthermore, the study uses Social Cognitive Theory to explain how parents' digital capabilities and level of understanding are personal factors that operate within an environment shaped by access to devices, internet connectivity, and GenAI applications. The fact, though, that parental behaviour and the students' learning outcomes were not directly observed means that the findings reflect the parents' own perceptions rather than the actual educational effectiveness of GenAI.

In practice, the results suggest that more inclusive digital parenting is possible by demonstrating how accessible generative AI tools could be used to help parents produce simple, visual, repetitive, and personalised English-learning materials. The study also shows that parents prefer well-known applications such as ChatGPT, Canva, Grammarly, and QuillBot to more specialised ones that deal with audio, video, coding, and research. This preference underscores the importance for developers to design affordable, easy-to-use, accessible, and child-safe generative AI platforms that include special-education templates and allow for customisation. Future research should employ longitudinal, experimental, or intervention-based approaches in order to determine whether parent training improves practical generative AI skills and leads to measurable learning outcomes among MBPK. Larger samples that include people from rural areas, different socioeconomic backgrounds, and various neurodiverse profiles would further explain how access to technology and individual learning needs influence the inclusive use of generative AI.

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