

## **TECHNOLOGICAL TOOLS USED BY MALAYSIAN TEACHERS TO ENHANCE ONLINE READING COMPREHENSION FOR PUPILS WITH DYSLEXIA AFTER COVID-19**

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*This study investigates the technological tools implemented by Malaysian teachers to facilitate the online reading comprehension skills of pupils with dyslexia after COVID-19. It seeks to understand teachers' experiences in selecting, modifying, and using online teaching materials. This study employed a qualitative phenomenological approach to gather data from nine teachers at three dyslexia schools. Data collection methods included semi-structured interviews, online lesson observations, and document analysis. The findings reveal that teachers utilised text-to-speech software, multimedia resources, and gamified platforms, modifying them to meet students' specific needs. To reduce cognitive load and facilitate comprehension, they implemented visual aids, interactive quizzes, and simplified instructions. Furthermore, collaborating with parents was essential in aligning the tools used to develop reading comprehension at home and at school. These findings address the research question by illustrating the technological tools and digital materials used by Malaysian teachers to support online reading comprehension among pupils with dyslexia. Moreover, the results highlight the importance of multisensory technology use, as well as the need for targeted professional development and increased investment in accessible digital resources to promote inclusive education.*

**Keywords:** Technological tools, online reading comprehension, dyslexia, online learning, COVID-19

## **INTRODUCTION**

Declared as a global emergency in December 2019, the COVID-19 pandemic caused grievous disruptions in education systems across the globe, including Malaysia, where over eight million students experienced school closures (Azahar, 2020; UNICEF, 2020b). This shift has forced an abrupt change to online education, disrupting conventional teaching practices and requiring teachers to adopt new digital tools and strategies (Naik et al., 2021; Alhalalmeh, 2021).

Online learning has brought unprecedented challenges for students with dyslexia as they already face inherent difficulties in word recognition, decoding, and comprehension (Proropapas & Parrila, 2018; IDA, 2019). Dyslexia hinders students' access to and processing digital texts, which require additional skills of finding, evaluating, and synthesising information (Coiro, 2014). To enhance engagement and support reading comprehension for these learners, teachers must apply creative technological tools such as text-to-speech software, multimedia e-books, and digital storytelling applications (Rahim et al., 2023; Rahul, 2021).

Based on previous studies in Malaysia, dyslexia is seen in 4-8% of school-aged children, indicating the necessity of a specific teaching strategy (Abu Bakar et al., 2024). However, the transition to online education highlighted gaps in teacher preparedness, especially in delivering tailored education for students with dyslexia in digital learning environment (Subramaniam & Kunasegran, 2022). While prior studies have emphasised general challenges associated with online learning, limited attention has been given to the specific technological tools and digital teaching materials used by teachers to support online reading comprehension for pupils with dyslexia. Therefore, effective integration of technology into teaching practices remains essential for addressing these gaps and fostering meaningful learning (Sung et al., 2016).

In response to this gap, this article aims to present the technological devices and strategies used by Malaysian teachers to facilitate online reading comprehension for pupils with dyslexia during online education. It seeks to identify online teaching materials used by the Malaysian teachers to meet the specific needs of the pupils and support their academic performance in the age of digitally driven content and education by examining these lived experiences.

## **LITERATURE REVIEW**

Dyslexia represents a neurobiological learning disability that is characterised by a long-standing impairment in word recognition, spelling, and decoding leading to a measurable deficit in reading comprehension (American Psychiatric Association, 2013; Proropapas & Parrila, 2018). Students with dyslexia often struggle with phonological processing, working memory, and executive

functioning, all of which are essential for reading success (Snowling & Melby-Lervåg, 2021). For instance, students with dyslexia often struggle with making inferences, creating links, and synthesising information, which leads to challenges in their schoolwork (Yıldız & Melekoğlu, 2020). Such challenges are compounded in digital learning environments where extra cognitive demands are needed, as in navigation and understanding multimedia contents (Vidal-Abarca et al., 2018).

Reading instruction for students with dyslexia has been shown to benefit significantly from the use of technology. Multisensory learning experiences are achieved through technology tools such as text-to-speech software, interactive e-books, and digital storytelling applications that accommodate diverse learner needs (Keelor et al., 2023). For example, text-to-speech tools allow students to hear text and read along visually at the same time, which helps them improve decoding and comprehension skills (Dawson et al., 2019). Interactive e-books containing multimedia (videos, animations, etc.) have also improved student engagement and understanding (Mariani et al., 2024).

In addition to assistive reading tools, several digital platforms support literacy development by enabling learners to edit, summarise, and annotate texts. Digital platforms like Grammarly aid the development of reading and writing as they enable its users to edit, summarise, and annotate (Nguyen, 2025). Translation software such as Google Translate improves understanding for learners with texts from other languages, contributing to inclusive content and cultural awareness (Alotaibi & Salamah, 2023). Beyond tools, studies emphasise the significance of using evidence-based instructional strategies for enhancing the reading comprehension of students with dyslexia. By actively teaching students strategies for comprehension including summarising, questioning, and predicting, explicit instruction has been shown to greatly improve comprehension skills in readers (Duke et al., 2021).

Multisensory instructional approaches further support reading comprehension development among students with dyslexia. Orton-Gillingham is an example of a multisensory approach that incorporates visual, auditory, and kinaesthetic-tactile learning methods and has added success in supporting students in creating phonics, vocabulary, and comprehension skills (Stevens et al., 2021; Fujita, 2024). The approaches include collaborative learning and self-regulated strategy development (SRSD), both of which ensure students are actively engaged and are aware of their types of performance. One example is SRSD which teaches students how to plan, monitor, and evaluate their learning and results in improved reading comprehension (Sanders et al., 2019). Graphic organisers, which visually depict connections among ideas, have proven to help students organise and summarise information in such a way that it facilitates later text retention and comprehension (López & Campoverde, 2018).

Despite these instructional benefits, online reading creates distinct obstacles for students with dyslexia, such as visual interference from pop-up advertisements and difficulties in navigating non-linear layouts and a lack of personalised support (Bas et al., 2020; Vidal-Abarca et al., 2018).

This increases cognitive load and disrupts comprehension. For example, pop-up advertisements and multimedia elements can capture the attention of students, while varying the text format can disrupt the flow of texts information (Niklaus et al., 2023). While some may find online or digital materials more challenging, the interactive potential of web-based formats (e.g., adjustable font sizes and text-to-speech functions) provide an avenue to personalise and tailor reading experiences (La Marca et al., 2020).

In the Malaysian context, the transition to online learning during the COVID-19 pandemic highlights key challenges in the integration of technology for reading instruction. The shift in teaching arrangements that had come without much preparation and training, coupled with the need for specialised instructional adaptations for students with dyslexia, made it difficult for teachers to adjust to the digital learning environment (Kaur & Bhatt, 2020; Subramaniam & Kunasegran, 2022). Moreover, the shortcomings of teacher preparedness in this adjustment stifled the appropriate use of digital tools and approaches to enhance reading comprehension (Naik et al., 2021). As hybrid and online learning became prevalent, the demand for customisable digital tools increased. This highlighted the critical need for professional development to prepare teachers for inclusive instruction (Montalbano et al., 2024).

While existing studies have examined the characteristics of dyslexia, the effectiveness of technological interventions, and the challenges associated with online learning, limited attention has been given to how teachers select, adapt, and use technological tools and digital materials to support online reading comprehension for pupils with dyslexia, particularly in post-COVID-19 contexts. This gap underscores the need to examine teachers' instructional practices with technological tools, which forms the focus of the present study.

## **PURPOSE OF THE STUDY**

The purpose of this study is to investigate the digital teaching tools employed by the teachers in order to develop online reading comprehension skills of pupils with dyslexia after COVID-19. Examining teachers' experiences with these materials is crucial to identifying effective instructional adaptations and addressing the existing gap in support for neurodiverse learners in digital environments. Accordingly, the study focuses on exploring the experiences of teachers in using teaching materials when teaching online reading comprehension to pupils with dyslexia after COVID-19. This manuscript depicts one aspect from the study namely to highlight: What technological tools are used by Malaysian teachers to support online reading comprehension among pupils with dyslexia after COVID-19?

## **METHODOLOGY**

### **Research Design**

The research adopts a qualitative phenomenological design to explore the lived experiences of Malaysian teachers in teaching online reading comprehension to pupils with dyslexia. A phenomenological study is a suitable approach for this study that seeks the essence of participants' experiences and provides rich and detailed perspectives into the challenges and strategies employed by teachers in the online education of pupils with dyslexia.

This approach was selected over other qualitative methods for its unique focus; while a case study focuses on a bounded system and ethnography on cultural patterns, phenomenology is specifically designed to illuminate the 'essence' of human experience (Neubauer et al., 2019). This makes it particularly suitable for examining the shared instructional experiences of teachers in online reading contexts.

### **Sample of the Study**

This study's sample comprises nine teachers who taught online reading classes to pupils with dyslexia after COVID-19. These participants were selected from three different centres under the *Persatuan Dyslexia Malaysia* (PDM). The sample size of nine participants was considered methodologically sufficient, as phenomenological research prioritises depth and richness of lived experience rather than numerical representation. Literature suggests that data saturation is often achieved within a relatively small, homogeneous sample when the phenomenon under investigation is clearly bounded (Guest et al., 2020).

All three participating centres were chosen from the same NGO-based organisation (PDM) which follow a standardised instructional approach to ensure contextual consistency and enhanced the transferability of the findings. All centres were situated in urban settings and implemented systematic online reading instruction during and after the pandemic, providing a comparable and highly relevant context for examining instructional practices.

### **Sampling Method**

Participants were selected using purposive sampling method that would provide the most informative input on the research topic. This ensures that selection is based solely on people with relevant experience and expertise. Purposive sampling was considered appropriate for this study because specialised expertise was required to address the research question that focuses on the technological tools used by teachers to support online reading comprehension among pupils with

dyslexia after COVID-19. This sampling approach allowed for the deliberate selection of teachers with appropriate experiential and professional backgrounds related to the study focus. Participants were purposively selected based on the following criteria: (1) a minimum of three years of teaching experience in special education, (2) direct experience teaching pupils with dyslexia after COVID-19, (3) expertise in teaching reading skills tailored to the needs of pupils with dyslexia, and (4) experience in conducting online or digitally supported reading comprehension instruction. These selection criteria were directly aligned with the research question to ensure that participants possessed the relevant knowledge and experience necessary to provide meaningful insights into the use of technological tools for online reading comprehension.

It is acknowledged that purposive sampling may introduce sampling bias; however, as this is a qualitative study, the intention is not statistical generalisation but to obtain in-depth and contextually rich understanding of teachers' practices.

Participants were accessed through the participating dyslexia centres, where eligible teachers were identified and invited to participate on a voluntary basis following institutional permission. Table 1 presents the demographic and professional background of the participants.

**Table 1**

*The Participant Demographic Information*

Participant	Centre	Gender	Subject	Number of Years Teaching Pupils with Dyslexia
Teacher A1	PDM A	Male	Reading	10 Years
Teacher A2	PDM A	Female	Reading	6 Years
Teacher A3	PDM A	Female	Reading	9 Years
Teacher B1	PDM B	Female	Reading	4 Years
Teacher B2	PDM B	Female	Reading	4 Years
Teacher B3	PDM B	Male	Reading	4 Years
Teacher C1	PDM C	Female	Reading	8 Years
Teacher C2	PDM C	Female	Reading	7 Years
Teacher C3	PDM C	Female	Reading	10 Years

## **Instrumentation**

This research utilises three main tools for gathering data: the Interview Protocol, the Observation Protocol, and Document Analysis. Each tool is designed to collect thorough information on the teaching methods, experiences, and difficulties teachers encounter while instructing online reading comprehension to students with dyslexia after COVID-19. All instruments were developed based on the research question and relevant literature on online learning and dyslexia. To enhance validity, the interview and observation protocols were reviewed by an expert panel in special education and educational technology and were pilot-tested prior to the main data collection. The use of multiple instruments also enabled triangulation, allowing for cross-verification of data across different sources.

The Interview Protocol aims to collect detailed information from teachers about their views, experiences with instructional strategies, and utilisation of teaching resources in online reading comprehension. The semi-structured format allowed teachers to elaborate on the technological tools employed, the purposes of their usage, and the challenges in supporting pupils with dyslexia, thereby addressing research questions related to the identification and use of technological tools in online reading comprehension instruction.

The Observation Protocol aims to gather real-time information from online reading comprehension sessions, concentrating mainly on technology utilisation. Observation sessions were conducted with one interviewed teacher from each participating school, selected based on voluntary participation and continued use of online teaching materials. Each participating teacher was observed for three instructional sessions, with each session lasting one class hour, resulting in a total of nine observed class hours. Observations were conducted as live, non-participant observations and were video recorded with participants' consent. The collected data aided in comprehending how the observed instructional practices and technological tools were implemented in authentic classroom settings, allowing for direct comparison between reported practices and observed use of technology.

Ultimately, Document Analysis was used to review applications and online teaching materials used for online instruction, photographs of classroom activities, and samples of online homework to evaluate how these resources supported online reading comprehension for students with dyslexia. Documents were analysed using a qualitative content-focused approach to examine their instructional purpose, relevance to reading comprehension, and alignment with the research focus. These tools provided essential information to comprehensively understand the research issue.

## **Procedure of the Study**

The researcher obtained the required approvals from the Universiti Malaya Research Ethics Committee (UMREC). The participants were selected based on pre-established criteria, and voluntary consent and required institutional approvals were obtained beforehand.

Data was collected from using teachers via semi-structured interviews, observations of online reading comprehension lessons, and document analyses of collected documents of software and applications used. The researcher gave a brief description of the study during the interviews and aimed to ensure participants were comfortable, allowing them to take breaks if needed. The researcher moreover audio-taped participants' answers to enhance the richness of the data in addition to video recording during observation. Once the data collection was completed, the researcher engaged in the process of data analysis, writing up their results, and writing a discussion chapter that interrogated the findings of the research and the literature review.

## **Data Analysis**

Data analysis in this study followed a thematic analysis approach, which involves several steps to identify patterns or themes within qualitative data (Braun & Clarke, 2006). The process starts with data familiarisation, where the researcher immerses himself in the data by reading and re-reading transcripts, field notes, and other materials to become familiar with the context. Initial coding is then performed using inductive and deductive methods to tag meaningful data units. This coding process is done manually and with AI software assistance (Atlas.ti 25), where similar codes are grouped to form broader categories.

Once the original codes are generated, the next stage in this cycle is that of theme development, wherein patterns and relationships are identified, and broad themes are formed that convey the essence of what the data is trying to inform. The last stage entails showcasing the analysis and including data quotes to demonstrate and reinforce the identified themes. To improve validity and reliability, the research utilised thorough documentation and software applications corresponding to modern developments in thematic analysis (Braun & Clarke, 2006).

## **RESULTS**

### **Material Selection**

Teachers faced challenges in selecting materials for online education because it requires innovative approaches to adapting traditional resources to the digital environment. High costs, logistical barriers, and the need for digital equivalents complicated this transition. These challenges limited teachers' immediate access to level-appropriate digital reading materials, making material selection a critical instructional decision rather than a routine task.

*“Quite a few times to get them used to the spelling and recognising the words whereas now online it is very hard to get them to sit and read something that is suitable for their level trying to find because these online readers that we have in the class, we did not have like a PDF version of them, we only had hard copies. So I was trying to find a soft copy of a reader that we can use. But that was either they are quite expensive, and so, I would either had to pay it out of my own pocket or try to get from the school.”*

(INT-A1)

Teachers used multimedia resources (videos, Power Point presentations, and educational apps) to create engagement, and to add interactive features like quizzes and vocabulary games. These interactive elements were perceived as effective because they increased pupil engagement and provided immediate feedback, which is particularly important for pupils with dyslexia who require frequent reinforcement. These tools also helped parents to support younger learners.

*“I used a resource called People and several websites, including one called Life Worksheet. I also used online textbooks to aid in teaching.”*

(INT-B1)

*“The materials should have various colors and big fonts because dyslexic students don't like plain designs. The colors and fonts help make the material more engaging and easier to read.”*

(INT-B2)

*“The teacher selects the material based on pupil's ability to engage him and improve his comprehension. The app's interactive stories, quizzes, and vocabulary games are visually appealing and easy to navigate, making them well-suited to the lesson's objectives.”*

(OBS- A1-S2)

Teachers utilised multimedia resources such as videos, Power Point presentations, and educational apps to enhance engagement, often combining these with interactive features like interactive quizzes and vocabulary games from different online platforms. These interactive

elements were perceived as effective because they increased pupil engagement and provided immediate feedback, which is particularly important for pupils with dyslexia who require frequent reinforcement. These tools also supported parents in assisting younger learners.

*“Using quizzes, pictures, and videos helped. However, help from the parents are required.”* (INT-A2)

*“The teacher selects materials that are visually appealing and interactive, ensuring they are suitable for students’ comprehension levels. The video’s combination of word spelling, sentence construction, and short stories is particularly effective in maintaining student engagement and enhancing learning. After learning, teacher quizzed pupils from quiz creation platform”* (OBS-C1-S3)

Teachers used customisable teaching materials or material creation platforms to handle specific needs like letter recognition or reading comprehension. They adapted existing resources or developed new ones to fill the gaps in available materials.

*“I created my own teaching materials using Microsoft Word or Power Point. I made exercises for them and also used online resources.”* (INT-B2)

*“The teacher selects materials based on their ability to engage students visually and make the text accessible. The teacher considers factors such as readability, relevance, and the presence of visual aids when choosing materials.”* (OBS-B1-S2)

Overall, teachers showed adaptability and creativity in choosing and personalising materials, balancing the limitations of online platforms and the wide range of student needs.

## **Material Modification**

Teachers adapted online material by modifying and tailoring physical or existing online teaching materials to meet the different needs of students with dyslexia in the new online setting. Material modification was primarily driven by the need to reduce cognitive load and improve accessibility, and it aimed to enhance engagement, comprehension, and accessibility.

Visual aids played a crucial role in improving reading comprehension and attention for visual learners. The use of images and illustrations was effective because they provided contextual cues that supported meaning-making during reading tasks.

*"Most of the kids are visual learners, and pictures help them understand better." (INT-A2)*

*"If they don't understand something, I show them a picture." (INT-C3)*

*"You must have something that can attract students. I have students who, when there are no illustrations in colour, don't want to see, don't want to read." (INT-B1)*

Interactive elements in the form of digital games, quizzes, and even task simplification were integrated to simplify tasks and maintain engagement. Breaking tasks into smaller steps was perceived as effective in preventing cognitive overload and supporting comprehension.

*"The teacher uses clear, concise instructions and modifies tasks by breaking them into smaller, more manageable steps to ensure comprehension among students with dyslexia." (OBS-B1-S2)*

*"To maintain engagement, the teacher adapted instructional materials by adding... quizzes and digital games." (OBS-B1-S3)*

Videos were used to modify the teaching materials. Teachers customised videos with features such as highlighted vocabulary and visual aids to ensure that they aligned lesson objectives with multisensory learning principles.

*"When doing online classes, I fully use everything inside my house. When I find it very difficult, I switch to video. I create videos and use various apps to produce videos on the topics I need to teach...., I use YouTube and make PowerPoint presentation videos. For example, if today's topic is animals, I will create a video about animals. When it comes to reading comprehension or spelling exercises, I play the video one by one and call on the students one by one." (INT-C1)*

*"The teacher used customised videos to match lesson objectives, ensuring they are visually engaging and relevant to the topic being taught. These videos often include highlighted vocabulary to reinforce learning." (OBS-C1-S2)*

Some existing resources were adapted while many new exercises were created using Microsoft Word, Microsoft Power Point to target individual difficulties such as spelling, grammar, and comprehension, which were not adequately addressed by existing resources.

*"There is a website ... got quite a few thousand, and through that, I would go through some of those and then modify them as needed."* (INT-A1)

*"But mostly, I make the teaching materials myself using Microsoft Word and Power Point. For example, if a student needs to learn the missing alphabet, I create an exercise in Microsoft Word where they can match the letters..."* (INT-B2)

*"Even though we as teachers have tools, the students at home don't have them, so how can we... We're good at creating tools to use it online."* (INT-C2)

*"During online classes, the teacher creates personalised exercises using Microsoft Power Point to target specific student difficulties."* (OBS-A1-S2)

### **Online Reading Comprehension Tools**

Malaysian teachers utilised various online reading comprehension tools to enhance reading comprehension for pupils with dyslexia after COVID-19. Teachers used multimedia and voice-based tools to support reading comprehension by integrating features such as text-to-speech, interactive reading activities, and phonics games. These tools were particularly effective as they supported simultaneous listening and decoding, enabling pupils to access texts independently despite their reading difficulties. In addition, video-based tools like the Little Fox YouTube Channel (DOC-C1), Teacher Zubaidah Musa Channel, *Bacaan Pintar* Channel (DOC-B1), and Teacher Sal Channel (DOC-B2) combined storytelling with vision, text, and sound effects to keep students interested and facilitate the understanding of the content being learned.

*"If it is possible to use some kind of reading software that has a story you can just click and let the story be read out for you. So, there is a voiceover or narration. You can try to read the words on your own, but if there are any words you get stuck on, just click on the word, and it is spoken out so you can hear how to say it. Or just click on the narration, and it will read all of it for the child."* (INT-A1)

*"The website named XRE (Extra Reading Experience). On this website, we use materials for student reading. I share the screen, and pupils read from there. I use these materials for teaching skills to the pupils."* (INT-B3)

*"The Greygum software includes features like interactive reading activities, phonics games, and a voiceover narration option for students to follow along with text, enhancing both listening and reading comprehension skills." (DOC-A1)*

*"Normally I conduct two or three search on my own. If I find the material relevant, then I use it. I also use Google for visual readers and reading comprehension materials" (INT- A3)*

Digital reading materials and storytelling apps were extensively used to modify online lessons to pupils' individual needs and encourage engagement because they have multiple dyslexia- friendly features and exercises, which are easy for the students to access. These platforms supported comprehension by presenting narratives in a visually structured format and helped sustain student interest better than static text.

*"It's best to use online typical children's storybooks that are easily accessible, either freely or through online archives, which they can read beforehand." (INT-A1)*

*"Using quizzes, pictures, and videos helped. However, help from the parents are required." (INT-A2)*

*"I also used online textbooks to aid in teaching. These resources helped me tailor the lessons to each student's needs and level of comprehension." (INT-B1)*

*"Interactive flipbooks like 'MARI MEMBACA' from [www.anyflip.com](http://www.anyflip.com) e-books website include visually appealing pages with various reading exercises, motivational content, and certificates for student achievements." (DOC-B1, DOC-B2)*

The teachers utilised online platforms offering interactive worksheets, customisable teaching materials, and customisation platforms for reading comprehension activities. The flexibility of these platforms allowed teachers to adjust the difficulty level of reading passages and exercises to match each student's proficiency.

*"I think the most beneficial material is the live worksheet because it offers various techniques. Pupils can match items, write answers, and listen and match audio." (INT-B2)*

*"I use soft copies from LiveSheet and also create my own PDFs. I share these materials with the pupils to read." (INT-B1)*

*"Normally I conduct two or three research on my own. If I find the material relevant, then I use it. I also use Google for visual readers and reading comprehension materials."* (INT- A3)

*"Pinterest provided multisensory exercises, reading comprehension activities, and visual aids designed for students with dyslexia."* (DOC-A2)

*"Teachers created visual storytelling content using Canva to engage students with tailored reading comprehension exercises."* (DOC-B2)

Gamified platforms, specifically *Kahoot*, *Quizizz*, *Wordwall*, and *Socrative*, were utilised to reinforce reading skills. These gamified platforms were effective because they incorporated competition, immediate feedback, and visual interaction. They increased motivation and participation among pupils with dyslexia.

*"Quiz websites like Kahoot, Quizizz, and Socrative provided game-like platforms for reinforcing reading comprehension through quizzes."* (DOC-A2)

*"wordwall.net has activities incorporated gamification with leaderboards and timed challenges to maintain student interest. The platform used gamified learning methods to reinforce language concepts, clear instructions provided within each quiz, and use of visual and interactive elements to support comprehension."* (DOC-B1)

*"Observational confirms that Teacher data B1 used Reading Comprehension apps on tablets that included interactive stories, quizzes, and vocabulary games. These tools provided immediate feedback and were very useful in engaging pupils as well as meeting their individual learning needs."* (OBS-B1-S1)

Real-time sharing of resources and collaboration between teachers, students, and parents were facilitated through communication platforms such as WhatsApp Groups (DOC-A2, DOC-B1), *Telegram-Koleksi* BBM Official (DOC-C3), Facebook-TCHER COLLECTION (DOC-A2, DOC- C3). These tools bridged the gap between home and school, ensuring that parents received the necessary guidance to assist their children with the customised materials.

*"We sent everything, worksheets, everythings, the picture, flashcards, whatever, we sent it by email or through WhatsApp for the group."* (INT-A2)

**Table 2**

*The Common Characteristics of Online Educational Resources*

Characteristic	Description	Examples
Interactive Comprehension Activities	Engages pupils in active learning through quizzes, matching exercises, and reading tasks.	ISL Collective, LiveWorksheet.com, Fitzroy
Adaptability to Individual Learning Needs	Allows teachers to customize reading materials for different literacy levels and learning styles.	Pinterest Worksheets, LiveWorksheet.com
Use of Visual and Contextual Aids	Combines visuals with text to help pupils connect words with images, improving comprehension.	Mr. Bean Cartoons, Flashcards, Little Fox YouTube Channel
Multimedia for Enhanced Engagement	Uses videos, animations, and interactive elements to engage pupils and make reading more accessible.	YouTube Educational Channels, Spinout Stories
Support for Repetition and Reinforcement	Emphasises repeated exposure to text and practice to reinforce reading comprehension.	Fitzroy Readers, XRE
Gamification to Motivate Learning	Adds game-like elements to reading tasks, making the process engaging and motivating.	Kahoot, Wordwall.net
Facilitation of Collaborative Learning	Enables real-time communication and collaboration between teachers, pupils, and parents.	WhatsApp Groups, Google Meet
Immediate Feedback and Progress Tracking	Provides real-time feedback to monitor progress and correct mistakes during reading tasks.	LiveWorksheet.com, iKurnia App

## **DISCUSSION**

This study's findings illuminate Malaysian teachers' experiences in selecting, adapting, and utilising teaching materials, especially technological tools to support online reading comprehension among pupils with dyslexia after COVID-19. These students were already struggling at the onset of the transition to online learning, facing significant cognitive implications, such as the need to adapt to digital formats and harness multimedia (Vidal-Abarca et al., 2018). Such challenges, coupled with limited preparedness and resources among teachers after COVID-19, called for inventive strategies to adapt teaching practices to needs of students with dyslexia (Naik et al., 2021). The effectiveness of these strategies lies in their ability to reduce cognitive load, increase engagement, and provide multisensory input as they are critical for supporting reading comprehension among pupils with dyslexia. This study underscores the teachers' concrete strategies, especially in material selection and adaptation, to overcome these challenges and boost student engagement and understanding.

Teachers had tremendous challenges in choosing appropriate content for online teaching. For example, the requirement to shift from physical resources to digital puts financial pressure on teachers. In addition, teachers accommodated teaching and learning material issues where they could not find appropriate visual tools for students with dyslexia online reading comprehension. These challenges were particularly problematic because pupils with dyslexia rely heavily on visual and structured supports to process text. Other studies have also identified inadequate preparation and training among teachers and children's academic immersion that require special handling as significant barriers to online adjustments (Kaur & Bhatt, 2020; Subramaniam & Kunasegran, 2022). Among the solutions used, teachers relied on LiveWorksheet.com and Fitzroy Readers, which include interactive comprehension activities and adaptable content. Finally, these tools were effective because they allowed reading tasks to be adjusted according to pupils' literacy levels, aligning with evidence that tailor-made reading materials can benefit students with dyslexia (Bas & Akyol, 2020).

Another pillar of the strategies that were adopted was multimedia tools. Teachers used videos, Power Points, and educational apps to teach visually appealing content. Multimedia resources were effective because they combined visual and auditory input, supporting multisensory processing and sustaining attention, which are essential for pupils with dyslexia who struggle with independent decoding (Dawson et al., 2019; Stevens et al., 2021; Keelor et al., 2023). For instance, other resources such as the Little Fox YouTube channel and Spinout Stories use content like video clips and animations to break down complex ideas and keep students engaged. Furthermore, these tools facilitated repetition and reinforcement that are fundamental to advancing reading fluency and retention in students with dyslexia (Fujita, 2024).

Modifying materials was vital in personalising resources to meet the needs of individual learners. Teachers often produced or adjusted customised materials in Microsoft Word and Power Point, making things easier and more visually appealing. These modifications were effective because they reduced abstraction and provided visual scaffolding. Background research regarding the effectiveness of simplifying tasks and using visual scaffolding for comprehension includes visual objects such as images and illustration references (Kibby et al., 2014). For example, teachers used visuals to minimise abstraction and frame the discourse, which helped visual learners. In addition, Kahoot and Wordwall gamified tools added a game-like element to reading assignments with elements such as leaderboards and time-based challenges. Gamification was perceived as effective because it increased motivation, encouraged sustained participation, and transformed reading tasks into engaging learning experiences, consistent with prior contemporary research on the psychological benefits of gamified learning for special education (Yıldız & Melekoğlu, 2020).

Interactive components, such as interactive quizzes or vocabulary games, were incorporated to accommodate different learning needs and offer instant feedback. Tools like LiveWorksheet.com enabled real-time progress tracking so teachers could monitor comprehension and tailor instruction. Immediate feedback was particularly valuable because it helped pupils identify errors quickly and reinforced correct responses, supporting comprehension development as in line with research that identifies timely feedback as a significant contributor to reinforcing learning and correcting misunderstandings (Fitzhugh & Hoover, 2019).

The involvement of parents was key to the success of these strategies, especially for younger students needing support with videos or interactive tools. Home-school collaboration enhanced the effectiveness of technological tools by ensuring continuity of support beyond online lessons as it was highlighted in previous research that the collaborative nature of dyslexia interventions is foundational (Coiro et al., 2014) and that engaging caregivers in literacy activities is particularly effective. Teachers turned to communication platforms such as WhatsApp and Telegram to share customised materials, resources and communicate regularly with parents. Through the home-school partnership enabled via this collaboration, the connections that they, as educators, have with children at home etched memories and facilitated learning, even when we were doing so away from the classroom.

There were systemic hurdles, however, despite the success. Teachers frequently bore personal costs to procure adequate digital resources, and little institutional assistance was provided. This highlights more significant systemic issues, such as lacking training and resource allocation, that prevent the successful use of digital tools (Naik et al., 2021; Subramaniam & Kunasegran, 2022). This highlights a significant gap in institutional virtual professional development and resource allocation, an issue that remains prevalent in inclusive education models globally (Montalbano et al., 2024). Despite these challenges, teachers are resilient, utilise free or cheap gamified platforms, and create customised materials that show their dedication to their students.

Finally, this research contributes to the literature on dyslexia and online education models, giving voice to the diverse range of powerful strategies Malaysian teachers use to facilitate reading comprehension in the online learning environment. The key aspects that determined the effectiveness of instruction include interactive quizzes, gamified platforms, multimedia resources, and customised materials in supporting online reading comprehension. These results are consistent with established frameworks for multisensory learning and evidence-based teaching while highlighting the necessity of systemic alterations, including improved professional development and the greater accessibility of resources. This study presents important findings for policymakers looking to improve learning environments for students with dyslexia in an online learning context.

## CONCLUSION

These findings show that Malaysian teachers adapted their instruction method successfully to facilitate the pupils' reading comprehension online after COVID-19. Key learning points show teachers' use of technological resources, text-to-speech software, multimedia e-books, and gamified learning platforms to help engage and support understanding. Also, the teachers adapted resources to student needs, providing visual support, interactive quizzes, and simplified directionality to help reduce vocabulary, aiding in the comprehension process. Working with parents and using creative tools like LiveWorksheet.com also helped narrow the divide between the home and school learning spaces. Collectively, these findings address the research question by identifying the specific technological tools and digital materials used by Malaysian teachers to support online reading comprehension among pupils with dyslexia after COVID-19.

The research focuses on how technology could assist students with dyslexia in overcoming their individual challenges in online learning. It also highlights the need for targeted, multisensory strategies, emphasising the crucial role of customised materials, interactive and adaptable resources in facilitating literacy progress. These findings highlight educators' agencies in navigating systemic challenges and offer critical insights for structuring inclusive educational practices.

Practically, the study indicates that professional development programmes should be created so that teachers can be trained to integrate digital technology into their classes. Such programmes should focus on training teachers in the effective use of gamified platforms, the creation of customised digital reading materials, and the application of multisensory strategies for pupils with dyslexia. Moreover, greater investment in accessible digital reading platforms, text-to-speech applications, and interactive online resources is needed to ensure equitable learning opportunities. In addition, better collaboration between schools and parents can enable more effective adoption of these strategies.

While this study adds to the existing literature, its limitations include a focus on the Malaysian context and a lack of longitudinal data. Future research is needed to determine the long-term impact of such tools on academic outcomes of students with dyslexia and explore emerging technologies to continue promoting inclusive practices.

In conclusion, this study contributes to both theory and practice by demonstrating how teachers' strategic use of technological tools can operationalise multisensory learning principles in online reading instruction. By offering empirical insights into teachers' lived instructional practices, the study provides a practical framework for educators, policymakers, and researchers seeking to advance inclusive and equitable literacy education for pupils with dyslexia in digitally mediated learning environments.

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