

Redesigning Maltese Language Workbooks: Bridging the Gap for Learners with Dyslexia

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Abstract

This study explores how graphic design principles can assist students with dyslexia in using Maltese language workbooks and educational materials. The research was conducted in two stages: first, adapting Maltese school textbooks to be dyslexia-friendly, and second, involving 20 students with dyslexia (aged 7-11, grades 3-6) to compare standard and adapted versions of these textbooks. The adapted textbooks followed British Dyslexia Guidelines and other accessible design principles. The research adopted an emancipatory approach, aligning with the Emancipatory Disability Paradigm and the Emancipatory Action Research model. Key findings highlighted the challenges faced by students, including spelling, reading difficulties, and time constraints. Participants highlighted the value of design improvements like larger fonts, better paragraph separation, and increased use of imagery. Additionally, inclusive strategies such as assistive technology, typing practice, and vocabulary pre-teaching were found to enhance accessibility. The study recommends creating scaffolded, adapted workbooks for online and print formats through stakeholder collaboration.

Keywords

Inclusive graphic design for education, workbook design, accessible graphic design guidelines, dyslexia

Introduction

Dyslexia, a learning difficulty (LD), hinders the ability to map letters to corresponding sounds, affecting reading and writing skills (Agrawal et al., 2019; British Dyslexia Association [BDA], 2022; Kohli et al., 2018). This study investigates the experiences of students with dyslexia in Maltese primary schools, with a focus on their interaction with workbooks.

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Using the Emancipatory Action Research (EAR) approach, the research aims to identify and address challenges these students face with non-dyslexia-friendly workbooks. It incorporates students' perspectives to suggest modifications based on design principles and dyslexia guidelines.

In the Maltese context, students diagnosed with dyslexia are educated within mainstream settings. This entails that students follow literacy education following mainstream approaches. The level of support a student with dyslexia receives might vary due to the school setting and also the severity. In Malta, students with dyslexia are only entitled to support from a Learning Support Educator (LSE) if they have comorbid difficulties (Ministry for Education & Employment [MEDE], 2020). If they are not eligible for an LSE, the teacher must make the modifications and offer the assistance necessary for them to access the curriculum. Recent initiatives have aimed to enhance the educational experience for students with dyslexia in Malta. For instance, the Dyslexia Friendly Schools Initiative has recognised schools like Siggiewi Primary and Gharghur Primary for their efforts in creating supportive environments (Malta National Dyslexia Conference, 2024). Additionally, schools such as De La Salle College have committed to dyslexia-friendly practices, with educators receiving training to better support students with dyslexia during curriculum time (Malta National Dyslexia Conference, 2024). Nonetheless, support is not evenly distributed as it is mostly context- and school-dependent.

An educator cannot underestimate the value of using appropriate typeface, colour, and images when teaching. Visual language is important for comprehending material since it uses fonts, colours and visuals. As Barnard (2013) and Lamour Sansone (2015) state, graphic design is about meaning and communication rather than aesthetics. Numerous studies emphasise the significance of these components in educational contexts (BDA, 2022; 2023; Behbehani, 2007; CAST, 2018a; 2018b).

The research on design principles in relation to dyslexia within the Maltese educational context highlights a significant gap in the existing literature. While there is a growing recognition of the need for dyslexia-friendly practices, the specific application of design principles tailored to the needs of dyslexic learners remains underexplored. Current studies primarily focus on students' experiences with dyslexia and the challenges they face within traditional educational frameworks (Falzon, 2019). However, there is limited empirical evidence evaluating the effectiveness of integrating design principles into educational materials and environments in Malta. This gap suggests a need for research that not only evaluates the implementation of these design principles but also examines their impact on students' educational experiences (Malta National Dyslexia Conference, 2024; MEDE, 2020).

British Dyslexia Style Guide (BDSG) and Universal Design for Learning (UDL)

A pivotal resource for adapting and designing educational material for individuals with dyslexia is the British Dyslexia Style Guide (BDSG; BDA, 2023). This guide provides principles that ensure that written material is accessible, benefitting not only individuals with dyslexia but all learners (BDA, 2022). The BDSG highlights the importance of graphic design by using readable fonts, headings and structure, colour, and layout to communicate and deliver better the learning content involving text (BDA, 2023). These principles can be applied by educators and workbook publishers to cater for the needs of all students.

Complementing the BDSG is the Universal Design for Learning (UDL), a framework aimed at making learning more inclusive by offering multiple means of representation, action, expression, and engagement (CAST, 2018a; 2018b). UDL emphasises the removal of barriers to learning, making it a valuable approach for designing dyslexia-friendly workbooks. Through UDL, all students can have access to the general curriculum via modifications and adaptations (Turnbull et al., 2010, p. 41, as cited in Tanti Burlò, 2010). Both the BDSG and the UDL Guidelines incorporate graphic design principles, reinforcing the notion that effective design can help prepare learning materials that address the needs of students with LD.

Research supports the UDL framework as a strength-based approach that enhances literacy instruction (Pilgrim & Ward, 2017; Rappolt-Schlichtmann et al., 2018). When linked to literacy, UDL necessitates modifications to the materials and planning, including well-planned reading and writing instructions, to make the content accessible to everyone (Pilgrim & Ward, 2017). It is essential to consider how challenges related to text, reading, language processing, and writing can act as barriers to learning for students with dyslexia (Rappolt-Schlichtmann et al., 2018). UDL promotes Literacy by Design (LBD) through technology-based solutions that facilitate reading comprehension, such as scaffolded e-books and synchronised highlighting (Coyne et al., 2012; Pilgrim & Ward, 2017).

Teaching Strategies and Assistive Technology

A teaching strategy that can help when students start “reading to learn” rather than continuing “learning to read” is the Text Structure Strategy (Agius (Xuereb) & Zammit, 2021; Beerwinkle et al., 2018). The teaching of Expository Text Structure, meaning how written information is organised, is significant and should be included more (Akhondi et al., 2011; Agius (Xuereb) & Zammit, 2021, Beerwinkle et al., 2018). In fact, the Text Structure Strategy is a reading technique that seeks to assist students in understanding expository writings and that helps information retention and retrieval (Akhondi et al., 2011; Meyer et al., 2018; Simoneau et al., 2018). By engaging in workbook observation activities, students learn to recognise text structures and identify organisational methods, ultimately enhancing their comprehension of content (Coppens, 2019). The better students understand text structure, the better they can understand the content (Akhondi et al., 2011; Meyer et al., 2018). Text

structures can help to notice which and why text is in bold, in colour, where lists are, and also learn to internalise the information, for example, if there is description text, one can organise it in a mind map. In line with this, Arfé et al. (2018) discuss using this structure strategy for struggling readers and students with dyslexia by using text simplification. In fact, text simplification is modifying text “to make it more understandable or readable for target groups of readers” (Arfé et al., 2018, p. 2191).

In addition to text structure, interactive and structured multi-sensory techniques are vital, as they engage multiple senses in the learning process (Falzon, 2010; Goswami, 2015). According to the International Dyslexia Association (2019), effective learning involves linking visual, auditory, and kinaesthetic-tactile pathways. Furthermore, incorporating assistive technology (AT) is essential for enhancing access to workbooks and lessons. AT encompasses any adaptive device or service that increases participation, achievement, or independence for students with disabilities (OCALI, 2013).

Digital and Print Materials

Integrating digital technology with printed workbooks is crucial for supporting students with dyslexia. For instance, the Tikka Malti utilised in this study provides online downloadable resources, such as additional worksheets and podcasts, which enhance technological support for Maltese students and educators (Merlin Publishers, 2018a). Furthermore, the BDSG (BDA, 2023), the Practical Handbook on Accessible Graphic Design (Association of Registered Graphic Designers [RGD], 2021), and UDL (CAST, 2018b) all include guidelines for online material and digital adaptations, emphasising the need for accessible resources.

In Malta, textbooks are the predominant medium for instruction, with 86% of educators relying on them as a primary resource (MEDE, 2013). This percentage is higher than the international average of 72% (MEDE, 2013). On the other hand, worksheets and workbooks are used as a supplement by 50% of Maltese educators, with 45% using them as a basis for instruction, which is in line with international trends (MEDE, 2013).

While worksheets and workbooks serve as supplementary materials, their effective design is critical for student engagement and understanding. The shift from narrative to expository text in workbooks requires careful consideration of instructional methods, as expository texts necessitate different cognitive processes compared to narrative texts (Agius (Xuereb) & Zammit, 2021; Beerwinkle et al., 2018). Narrative text is what students are mostly familiar with from an early age when they start listening to stories and using narratives to learn to read (Beerwinkle et al., 2018). On the other hand, expository text requires different mental tasks because of dates and facts, contrasts, comparisons, causes, and effects, among others (Beerwinkle et al., 2018; Kraal et al., 2018).

The choice of educational workbooks is influenced by various factors, including curriculum changes and cost considerations (Issitt, 2004; Valverde et al., 2002; van den Ham & Heinze, 2018). Authors and designers must interpret the curriculum effectively to create learning opportunities that facilitate comprehension and engagement (Valverde et al., 2002). However, a lack of awareness regarding dyslexia in workbook selection can hinder effective learning, underscoring the importance of educator feedback in the selection process. As an LSE in the primary years, the researcher meets students encountering difficulties as soon as they start accessing information and using workbooks. Access to information for students with LD is crucial, and if not provided at this early stage in their development, it may lead to greater difficulties as they grow older (Saracho, 2017; Wildová & Kropáčková, 2015). Through the primary years, all the students use the same workbooks, and if students diagnosed with LD lack an educator to provide adapted materials and support, the students face difficulties. It is only through understanding and catering to their needs that their rights can be respected (Falzon, 2010). If educators and policymakers think that one size fits all and do not cater for their diverse learners, students with LD will keep facing barriers (Bartolo et al., 2007).

Inclusive Graphic Design

This study emphasises the need for inclusive graphic design principles in creating accessible educational materials. The guidelines discussed include the BDSG and various recommendations for inclusive graphic design (Behbehani, 2007; Bohm, 2014; 2019; Brown, 2020; CAST, 2018a; RGD, 2021). While the focus is on printed and educational materials, references to the Web Content Accessibility Guidelines (WCAG) 2.1 and the EU Directive on Accessibility underscore the importance of rights to accessibility and education as outlined in the UN Convention on the Rights of Persons with Disabilities (UN, 2006, Art. 9, 21, 24).

The common design elements that affect legibility and readability, as outlined in the BDSG and graphic design guidelines, include typography, structure, layout, colour, and the use of images (BDA, 2023; Behbehani, 2007; Bohm, 2014; 2019; Brown, 2020; CAST, 2018a; Collins et al., 2016; RGD, 2021). These elements are critical for ensuring that educational materials are accessible to all learners, particularly those with dyslexia. By adhering to these guidelines, educators can create more effective learning environments that support the diverse needs of students. Table 1 provides a summarised comparison of the BDSG guidelines when compared to the Graphic Design guidelines for accessibility.

Table 1
Comparing the BDSG with Graphic Design Guidelines for Accessibility

Design Elements	BDSG Guidelines	Graphic Design Guidelines for Accessibility
Typography		
Typeface & Font	Sans Serif Fonts; Suggested: Arial, Comic Sans, Verdana, Tahoma, Century Gothic, Trebuchet, Calibri, Open Sans	Sans Serif Fonts; Suggested: Sassoon/Twinkl, Sylexiad, Read Regular, Lexie Readable, Dyslexie, OpenDyslexic, Andika
Font Size	12-14 point; larger for dyslexia	Must accommodate different typefaces; consider output quality and viewing conditions
Type Weight	Use bold; avoid italic/underlined	Use bold; avoid oblique/italic/script/underlined; maintain stroke weight to character height ratio < 1:10
Line Spacing	Larger spacing aids readability; extra around headings and paragraphs	Maintain 1.5 to 2 times greater than font size; extra spacing around headings and paragraphs
Letter & Word Spacing	35% of average letter width	0.12 times font size to avoid tight/excessive tracking
Letter Case	For continuous text, capital/title case/ uppercase letters should be avoided	Same as BDSG; all caps should be limited to show difference/emphasis for texts that contain few words
Typography		
Typographic Hierarchy	Consistent structure with headings; table of contents suggested	Use titles/subtitles for clarity; size and darkness indicate significance
Layout		
Line Length	Short sentences (60-70 characters); avoid multiple columns and long paragraphs; use bullet points/lists	Ideal line length: 10-12 words or 45-90 characters; multi-column layouts hinder accessibility
Text Alignment	Left align without justification	Left text alignment preferred; avoid hyphenations
Logical Sense Breaks	Maintain logical sense breaks with left alignment to avoid uneven spacing and widows/orphans	Same principle applies
Margins & White Space	Helps remove clutter near text	Same principle applies
Colour Usage		
Backgrounds	Single-colour backgrounds without distractions; sufficient contrast between background and text	Same as BDSG; avoid red/pink and consider warm colours for dyslexic readers
Print Considerations	Use matte/uncoated finish to minimize glare; thick paper recommended	Same as BDSG
Use of Images		
Image Quality	Use images to support text and locate information effectively	High-quality images (300dpi); images should enhance understanding

Towards Dyslexia-Friendly Schools and Resources

Awareness about dyslexia-friendly books in Malta is being raised (Carabott, 2018) with the help of Maltese government agencies, such as the National Literacy Agency (NLA; MEDE, 2020) and the consultation document “The National Literacy Strategy (2021-2030)” (MEDE, 2021), the SpLD Service and the Dyslexia Friendly Schools (DFS) Initiative (MEDE, 2019a; 2019b), and also the voluntary association Malta Dyslexia Association (MDA; 2022).

The NLA serves as a primary driver in the area of literacy (Ministry for Education and Sport, 2021). The agency aims to improve literacy outcomes through inclusive practices, with one of its main goals being to support children with literacy difficulties (Ministry for Education and Sport, 2021). The agency offers programmes such as the Reading Recovery School-Based Literacy Programme and the NWAR Family Literacy Programme to assist students with literacy challenges (Ministry for Education and Sport, 2021). Furthermore, the NLA supports the creation, publication, and free distribution of literacy resources to schools, fostering an inclusive educational environment.

Training can help eliminate barriers for students with LD since educators would know what strategies work with these students (Falzon, 2010; Kohli et al., 2018). However, training must also include aspects of inclusive design, not only for educators but also for graphic designers and publishers. Furthermore, to achieve true inclusivity, it is essential that not only a selection of books should be dyslexia-friendly, but all textbooks and workbooks should use design principles that can help provide a holistic learning experience to all students. Additionally, strategies that are good for students with dyslexia can benefit all students (MEDE, 2019b). Dyslexia Friendly Schools are equipped with tools such as sticky notes, page overlays, highlighters, reading rulers, and word flashcards to assist students in class (MEDE, 2019b). Moreover, these schools actively share information about dyslexia with parents and dedicate sections in school magazines to this topic. This whole-school approach enables educators to integrate dyslexia-friendly strategies into their worksheets, smartboard presentations, and lesson plans (MEDE, 2019a; 2019b). When appropriate strategies are employed in workbooks and learning materials, students with learning disabilities can better reach their potential and achieve age-appropriate levels (Kohli et al., 2018).

Further studies are essential to evaluate the efficacy of the various dyslexia-friendly initiatives being implemented in Malta, as the current lack of empirical evidence makes it difficult to ascertain their effectiveness in improving literacy outcomes for students with dyslexia. Additionally, incorporating the students’ voices from an emancipatory perspective is crucial; understanding their experiences and needs can inform the development of more effective and inclusive educational practices, ensuring that interventions not only address academic challenges but also empower students in their learning journeys.

Research Questions

This study was guided by three research questions. The research questions focus on identifying the barriers students with dyslexia face when accessing information in Maltese language workbooks, analysing how design principles can assist in overcoming these challenges, and exploring inclusive methods that enhance access to educational material during Maltese lessons. By incorporating the students' voices from an emancipatory perspective, the study seeks to ensure that the experiences and needs of those directly affected by dyslexia inform the development of more effective and inclusive educational practices. This approach not only addresses the efficacy of existing initiatives but also empowers students to contribute to the conversation about their learning experiences, ultimately fostering a more inclusive educational environment.

Research Question 1: What barriers do students with dyslexia experience when they access information in Maltese-language workbooks?

Research Question 2: How can design principles be beneficial for students with dyslexia when accessing textbooks?

Research Question 3: In what ways can inclusive methods help students with dyslexia to better access educational information in the everyday classroom?

Methodology

The Research Design and Theoretical Framework: The Emancipatory Disability Paradigm (EDP) and Emancipatory Action Research (EAR)

The EDP is a research model that produces knowledge to empower people with disability to find solutions for their disabling barriers (Barnes & Sheldon, 2007). A type of research design with emancipatory intentions is Action Research (AR; Boog, 2003), which is built upon the emancipatory educational theory of Paolo Freire (Callus, 2022; Selener, 1997; Traina, 2015). Zuber-Skerritt (2001) refers to it as Emancipatory/Critical Action Research. EAR is collaborative, and practitioners use criticism and self-criticism to delve into a major issue that their study will tackle (Zuber-Skerritt, 2001). Through such design, the researcher “owns the problem” and feels responsible for solving it (Zuber-Skerritt, 2001). Hence, EAR is a type of action research based on the emancipatory paradigm, with the researcher aiming to help a group identify and act on unequal practices while producing knowledge and actions that are useful for them (Kramer-Roy, 2015). Furthermore, EAR tries to solve a problem with the participation of the group that is being oppressed (Selener, 1997).

The EDP, in line with the EAR approach, was used for this research since the active participation of students with LD is important to improve their lives as well as the accessibility and usability of information in a classroom setting. The term “emancipatory”

highlights the fact that this form of AR aims to intervene in the holistic aspects of a student with LD (Fals Borda, 2006; Reason & Bradbury, 2008), thus not only empowering the students with LD but influencing the way graphic design for education and workbooks can be more inclusive.

The Participants

The participant pool consisted of 20 students with dyslexia aged between 7 and 11, from Grades 3 to 6 (see Figures 1 and 2). Purposive sampling was used to select participants who were knowledgeable about the phenomenon, willing to participate, and able to provide unique insights (Schutt, 2009). Table 2 outlines the inclusion criteria used for participant selection.

Figure 1

Age of Participants

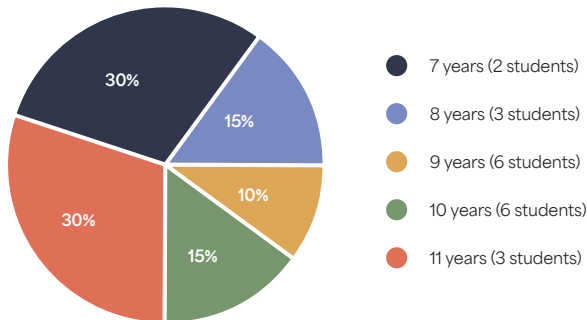
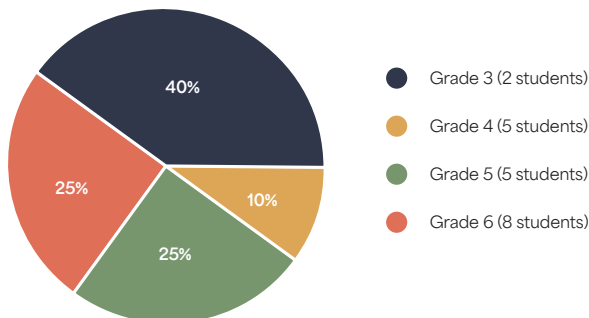


Figure 2

Year Group of Participants



The initial sample size was set at 12-15 participants, with additional participants added to reach better data saturation (Wormuth, 2022), the final number being 20 students. Information sheets were distributed between April and May 2023, and interviews were conducted during school hours between April and June 2023 (see Table 3).

Table 2
Inclusion Criteria for Participant Selection

Criterion	Description	Rationale
Ages	7-11 years old	This age range is when dyslexia can be reliably identified in primary school students.
Grades/Years	Grade/Year 3 to 6	These classes typically include students aged between 7-11 years old, aligning with the target developmental stage for the study.
Schools	Primary Schools in Malta	Including State, Church, and Private schools ensures representation across the main types of Maltese educational settings.
Number of Students	A minimum of 12 and a maximum of 20 students	This range balances feasibility with the need to reach theoretical/data saturation for meaningful findings.
Learning Difficulty	Dyslexia	Focusing on students with a psychological report and a formal diagnosis of dyslexia (with input from the SLT and/or INCO) ensures the sample is valid and well-defined.
Language/ Workbooks	Maltese language	The study examines how students with dyslexia engage with Maltese language learning and related workbooks/worksheets.

Table 3
The Number of Students with Dyslexia in the Schools that Participated in the Research

Grade	Number of Students with Dyslexia		
	First School	Second School	Third School
Grade 3	/	2	3
Grade 4	2	4	2
Grade 5	1	8	(not required - number already reached)
Grade 6	4	5	(not required - number already reached)
Total Distributed	7	19	5
Total Accepted	7	11	2

Interview Guide and Semi-Structured Interviews

Semi-structured interviews were chosen as the data collection method to better understand the participants' thoughts, feelings, and experiences when accessing information (Schutt, 2009). This method allows for open-ended questions and flexibility as interviewees are not restricted to a particular response as in quantitative surveys (Ponizovsky-Bergelson et al., 2019; Schutt, 2009; Wallace Foundation, 2022). The interview guide helped to determine which version the students preferred and why. Open-ended questions helped the discussions and provided deeper insights into the reasons for their preferences (Schutt, 2009).

Before each interview, the researcher explained the interview process in a few steps. The students and their guardians read the information sheet and consent form beforehand, and the researcher gave the students the opportunity to ask questions about the form and the study. To help the students feel at ease, they were reminded that the researcher is studying like them, that their opinion can help, and that they can say anything they feel since there is no right or wrong answer.

The interview guide prepared for this research was divided into three parts. The first part included basic demographics, such as age, year group, preferred language, and learning difficulty. In the second part of the interview, two samples of written material were presented, all covering the same content; sample one was a reading and writing activity from the Maltese workbook of their year group, while sample two was an adapted version redesigned using inclusive graphic design principles in line with the BDSG (BDA, 2023) and the Practical Handbook on Accessible Graphic Design (RGD, 2021). Some of the principles used when creating the adapted content included the choice of fonts, image styles, colours and backgrounds, and paper types and layout described in the two guidelines.

The adapted reading and writing activity from a Maltese workbook was used to compare the adapted content to the workbook content. This helped to analyse how students with dyslexia access and use both materials. Participants were asked to compare the two versions and provide their preferences and reflections on specific design elements such as font, paragraph structure, colour usage, background, image style, page layout, icon use, and paper type. Through a series of guided, semi-structured questions, students were encouraged to express which design features helped them read, understand, and complete the task more easily. The aim was to gather feedback on how visual and structural elements influenced their learning experience. This participatory approach also allowed students to suggest how they would improve the workbook design to better meet their learning needs. The adaptations served as a tool to implement change through participatory action research.

For the third part, semi-structured interview questions were asked to obtain the students' views and perspectives, in accordance with the study's research questions (Lewis, 2002; Nind, 2008). All interviews were audio-recorded and transcribed. For anonymity purposes, the 20 students were given codes ranging from S1 to S20.

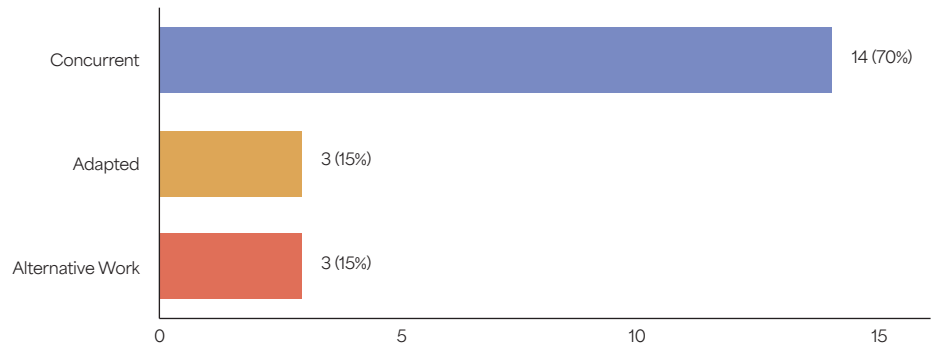
The Workbooks

The choice and adaptations of the workbooks played an important part in this research. The workbook chosen for this study was the same as the one used at the schools that accepted to participate. The Tikka Malti workbook was used by 14 of the students, with another three students using the workbook with adaptations and another three using alternative workbooks or worksheets (See Figure 3).

For the second part of the interview, the students had to analyse a reading and writing activity from the Maltese workbook of their year group. The second sample included the same content with design elements compliant with the BDSG (BDA, 2023) and the Practical Handbook on Accessible Graphic Design (RGD, 2021).

This research focused on Maltese language workbooks. Maltese workbooks were chosen since this research is based in Malta and intends to provide findings that can assist Maltese publishers, policymakers, and educators in creating more inclusive workbooks for students with dyslexia. The chosen workbooks were Tikka Malti 3b, 4b, 5b, and 6b, written by Clare Azzopardi and Leanne Ellul, illustrated by Erin Taylor, and published by Merlin Publishers (Merlin Publishers, 2018b). Tikka Malti is used in state, church, and independent schools. In fact, it is used in the majority of the church and independent primary schools in Malta (Agenda Bookshop, 2023). One reading and one writing activity from Grade 3 to Grade 6 were chosen and adapted from each workbook. The writing activity was mainly planning and writing a paragraph or essay, and the reading activity was a comprehension task with questions spread over two pages.

Figure 3
The Tikka Malti Workbook as used by the Participants



The Tikka Malti workbooks were selected for this research with the publisher's permission, allowing for the use and adaptation of specific workbook pages. Additionally, inquiries were made to various workbook publishers to gather further insights into the processes surrounding Maltese workbook publication, particularly in relation to inclusion and accessibility. As one publisher explained, the development of each workbook typically spans approximately 18 months and involves ad-hoc teams comprising publishers, editors, authors, consultants, illustrators, and designers (Merlin Publishers, personal communication, March 15, 2023).

In the case of Tikka Malti, Merlin Publishers has special dyslexia-friendly versions available on demand printed on a cream/yellow background paper instead of the regular white (Merlin Publishers, personal communication, March 15, 2023). Yet, as also discussed with the Dyslexia Specialist, these are not being used since there might not be enough awareness or knowledge of these workbook versions (Farrugia, C., personal communication, April 2, 2023). Merlin Publishers also has a series of children's readers that are dyslexia-friendly, using the well-researched dyslexia-friendly font Easy Reading together with other design considerations (Carabott, 2018; EasyReading, 2013; Merlin Publishers, personal communication, March 15, 2023).

The workbooks are also tried out by pilot classes before publishing, yet these pilot classes are not specifically targeted for dyslexia-friendliness (Merlin Publishers, personal communication, March 15, 2023). When asked about the page number, weight, and costs, the publisher stated that weight is a consideration, as is cost since in church and independent schools parents purchase textbooks themselves (Merlin Publishers, personal communication, March 15, 2023). Furthermore, with workbooks, they try to avoid perfect binding since the resultant spine fold will hinder students when writing and trying to open the book flat (Merlin Publishers, personal communication, March 15, 2023). So, wherever possible, the publisher chooses saddle-stitch/stapled, which limits the page number too (Merlin Publishers, personal communication, March 15, 2023). This is also stated in the literature review, since choosing a binding that allows the page to sit flat when opened is recommended (RGD, 2021).

Criteria for the Adaptations of the Workbooks and Validity

The designed adapted pages follow the recommendations of the BDSG (BDA, 2023) and the Graphic Design Guidelines for Accessibility (Behbehani, 2007; Bohm, 2014; 2019; Brown, 2020; CAST, 2018a; Collins et al., 2016; RGD, 2021). In all, the researcher chose around three pages of material from the workbook of each year group, which, when adapted, was spread across more pages.

Before conducting the interviews, the Dyslexia Specialist from MDA, who was recruited for this study, reviewed the adapted pages and interview guide for face validity. During the meeting, the adaptations and other aspects that help students with dyslexia were discussed. The Dyslexia Specialist, being an expert in this study's area, helped to establish validity for this

study. The Dyslexia Specialist also gave feedback on whether the interview questions were appropriate to get good answers for this study's research questions.

The Dyslexia Specialist agreed with using the pastel paper colour, yet she argued that a lot of workbook publishers and individuals think that only pastel paper is to be used to help dyslexia. She meets a lot of students who do not have a paper colour preference, and more awareness should be present to accommodate students with dyslexia. In line with this, pastel paper can help everyone because of the less contrast between the text and the paper. With regards to the interviews, the Dyslexia Specialist suggests asking the questions as soon as they start analysing the pages and keeping the interview unstructured to elicit more discussion. Keeping the interview short will also help the students remain focused and avoid fatigue.

Method of Data Analysis

Thematic analysis was applied through a six-step approach (Braun & Clarke, 2006; 2012). First, there was familiarisation with the qualitative data collected, which included transcribing, reading the data repeatedly, and identifying initial ideas. The first part of the interview was represented with pie charts since it included age, year group, language preference and workbook use. Pie charts also represented their preference between the workbook and the adapted material. The other information was transcribed and represented in a table.

The second step was generating initial codes, which included systematically marking and organising the data relevant to each code. Then, frequent codes were searched and organised into identified themes. The fourth step was reviewing the themes. This included generating a thematic pattern of the analysis through the checking of the themes that work "in relation to the coded extracts (Level 1) and the entire data set (Level 2)" (Braun & Clarke, 2006, p. 87). The fifth step involved defining and naming the themes. This included refining the details of each theme and the overall narrative of the analysis. It also incorporated creating clear definitions and naming themes and subthemes that correspond with the qualitative data. The last step was producing the research report. This was the endpoint and final opportunity for analysis that relates to the research question and literature (Braun & Clarke, 2006).

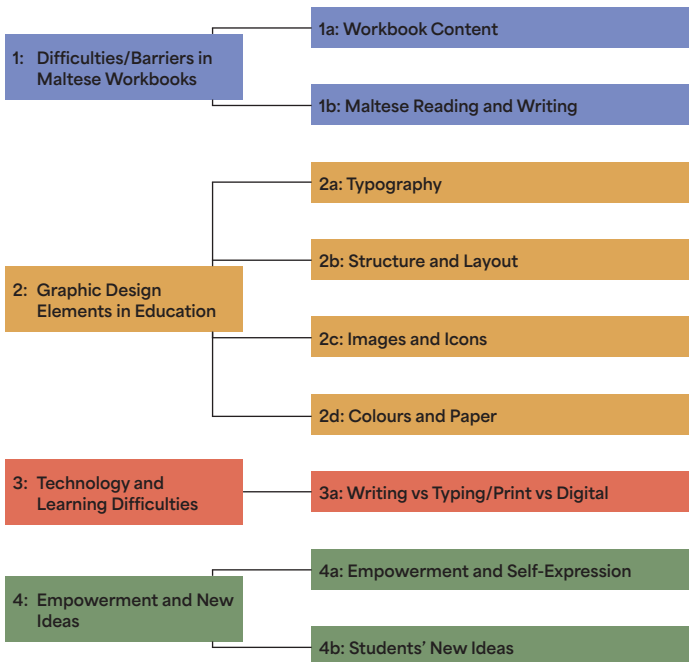
Meanwhile, the quantitative data was analysed through descriptive statistics, which provided data simplification, organisation, summarisation, and description, represented visually using pie charts (Loeb et al., 2017). Descriptive statistics helped to better communicate quantitative research findings, with the answers being discussed alongside the themes defined in the thematic analysis (Loeb et al., 2017). Although this research incorporated a quantitative component for certain questions, its primary methodology was qualitative (Abowitz & Toole, 2010; Barnes & Sheldon, 2007; Creswell et al., 2006; Mackenzie & Knipe, 2006; Harding & Whitehead, 2013; Pole, 2007). This integration of methods resulted in a mixed-method approach (Abowitz & Toole, 2010; Creswell et al., 2006; Pole, 2007).

After the interviews, the researcher became familiar with and transcribed the gathered data. After each interview, short notes were written on a Google Form to help organise the information. Following that, a table containing the transcripts was created, with the right column designated for notes. Using the Zotero software, initial codes were created and colour-coded to help organise and emphasise information in the transcripts. Then, various themes and sub-themes were identified, reviewed, and named.

Four main themes with relevant sub-themes were extracted, which are represented in Figure 4. These themes and sub-themes will be discussed in the next section.

Figure 4

The Themes and Sub-Themes



Data Presentation and Analysis in Themes

Theme 1: Difficulties/Barriers in Maltese Workbooks

Students with dyslexia face notable challenges when using Maltese workbooks, which can be categorised into two key areas: workbook content and difficulties with reading and writing in Maltese.

1a: Workbook Content. When students were asked about their opinions on Maltese workbooks, 11 expressed a dislike, 8 liked them, and 1 student was neutral. Students who enjoyed the workbooks appreciated their organisation, thicker pages that are “easy to turn” (S16), and “colourful” (S13) pictures. Some preferred exercises that involved “less writing and more circling words” (S2). However, students who disliked the workbooks struggled with complex content, and many felt that they “do not understand” (S1) the material, finding it “hard to use” due to a lack of visuals (S19). One student described their frustration, stating, “when I open them ... [I] remember school and how annoying it is” (S4).

1b: Maltese Reading and Writing. Five students mentioned challenges related to the Maltese language, with four finding it “complicated” and full of “hard words” (S3). Some students struggled with comprehension, explaining that when spelling, they would “focus on that word and then forget” (S1). Additionally, many students preferred conducting the interviews in English, with only two students opting for Maltese. Nonetheless, only S13 mentioned enjoying the Maltese Language, and explained that Maltese helps them to “imagine [that] I am in the story.” A further investigation about the visualisation when reading in English was not carried out as it was beyond the scope of the research; however, this provided the researcher with further insight for future research.

Theme 2: Graphic Design Elements in Education

This theme explores students’ preferences regarding the graphic design elements in their Maltese workbooks and adapted pages, focusing on typography, structure/layout, images/icons, and colours/paper.

2a: Typography. Sixteen students preferred the font of the adapted pages over the workbook font. Students highlighted the importance of font size and style, with 13 stating that the larger font made the text “easier to see” (S7) and read. S8 mentioned, “when I see [text] small ... it looks like it’s super hard”, while S3 found the workbook’s “tiny words” confusing. Seven students favoured the bold font on the adapted pages, particularly because bold and orange words made it “easier to find the answers” (S19) and “highlighted difficult words” (S11). Some students disliked cursive text, with S15 noting, “the one I cannot read is cursive”, which aligns with guidelines that discourage crowded fonts like cursive (BDA, 2023).

2b: Structure and Layout. Eighteen students preferred the layout of the adapted pages, finding the shorter paragraphs and increased spacing easier to read. Sixteen students appreciated the clear separation between paragraphs, with S5 noting that “spacing gives hope” because “you don’t see everything all at once.” Paragraph markers and spacing were especially helpful, with S4 stating that the adapted layout “shows you that it started a new paragraph”. The placement of difficult words and questions alongside or beneath paragraphs also aided students’ understanding, as S17 explained: “you can see things ... and it helps you a lot.”

2c: Images and Icons. Images were valued by students for their role in enhancing comprehension, with 12 students preferring the adapted pages’ images. Students noted that pictures helped them “understand immediately” (S8), and S13 mentioned that they “help me visualise and understand” the text. Students also liked the placement of images next to paragraphs, as it explained the content more effectively. In terms of style, preferences varied, with some favouring realistic images and others leaning toward illustrations. Additionally, 18 students liked the use of icons, which helped them “understand what [they] need to do” (S1) and made tasks clearer. As S9 explained, “you need to read, or listen ... or use the computer”.

2d: Colours and Paper. When discussing paper and colour preferences, 11 students preferred the ivory (yellow) paper used in the adapted pages, finding it easier on the eyes. S12 remarked, “yellow helps me focus better”, while S6 noted that “dyslexics see words moving on white papers”, making the ivory paper preferable. Five students preferred the white workbook paper, with S3 explaining, “I just like it to be white ... I feel more comfortable”. In terms of colour, 13 students liked the orange and black text on the adapted pages, finding it easier to read. S5 preferred the adapted pages because “white gives me the idea of exams, and the orange ones are nicer”.

Theme 3: Technology and LD

During discussions about technology and learning, students expressed preferences for digital versus printed materials, with nine favouring digital, seven preferring print, and four being unable to choose. Out of the nine students who preferred digital formats, six cited typing as faster and more enjoyable. S10 mentioned, “there’s no need to write with a pencil”, while S17 appreciated how “I can write quickly and ... quickly delete”. Three of the nine students also liked interactive features like dragging items and seeing one question per screen (S14). Conversely, students favouring printed materials felt more focused with handwriting. S4 shared, “writing is faster and I feel more comfortable.” Others, like S11, noted that they “feel better” when writing by hand. Students who could not choose between digital and print shared positive views on interactive elements and acknowledged the importance of typing practice, despite some difficulties, with S5 saying, “I really like to type but I take long,” and S9 preferring digital for clicking but paper for writing. Overall, many students who chose digital or print desired more interactive digital activities and typing practice.

In fact, although seven students preferred printed materials – citing comfort, focus, and ease of handwriting – three of them still expressed openness to using digital formats for interactive activities or support tools, such as reading texts on-screen or accessing online games.

Theme 4: Empowerment and New Ideas

This theme explores students' empowerment and creativity, focusing on what helped them feel supported in their learning and their ideas for improving workbook design. Fourteen students emphasised the importance of design elements like fonts, spacing, and layout. For example, S6 appreciated "clear/bigger words, pictures, longer lines, and space to write," while S11 found "titles in a box" helpful for making instructions more noticeable. Visual aids, such as icons and images, were valued by eight students for making tasks clearer, with S4 saying they help "explain what you're gonna do". Students also preferred shorter, simpler content. S3 suggested using "short words and not so many questions", while S8 proposed answering with drawings instead of writing.

All the students were invited to share new ideas for workbook design, allowing them to showcase their creativity. Eight students suggested adding key facts and flashcards, like S19's idea of using a highlighter to mark answers. S3 envisioned a workbook with flashcards and spelling aids, incorporating "a short book with a lot of pictures ... dots maybe, and they would spell it out", reflecting the flashcards by Read Write Inc. (Miskin, 2022; Partney School, 2023) and the Maltese Spelling Programme (SfCE, 2023). Students also proposed diverse methods for answering questions. S5 recommended offering choices, such as drawing instead of writing for true or false questions, while S2 suggested a cut-and-stick method for younger learners.

Personalising content was another recurring theme. Three students suggested customising stories or subjects, such as S13's idea to "put a question about dogs" for a friend who loves them. Additionally, some students wanted the ability to change the workbook's colours and layout. S14 suggested including a button to change the colour of the text, paper, or background for those who dislike white.

Technological innovation was also discussed, with S14 imagining a workbook that could lift itself as a "futuristic writing slope", highlight the relevant paragraph for each question, and include a button to call the teacher for help. These ideas reflect the students' desire for more personalised and interactive learning tools that cater to their individual needs and preferences, making them feel more empowered in their learning process.

Discussion

Research Question 1: What barriers do students with LD experience when they access information in Maltese-language workbooks?

Barriers that the students discussed were mainly difficulties with Maltese words and long comprehension passages. Students reported confusion with complex words and expressed a need for more time to process and respond to workbook tasks. These challenges often triggered feelings of frustration, stress, and a sense of inadequacy, rooted in spelling and reading difficulties. Although the Maltese language curriculum has shifted towards a focus on communicative skills and cultural elements (MEDE, 2014; 2021), students with LD continue to struggle with language proficiency, which hinders their ability to engage fully with workbook content.

When educational materials do not incorporate appropriate adaptations, such as those recommended by the BDA, the UDL principles, and scaffolding techniques, students with LD are left to face barriers from an early age. Also, the pace of the shift from narrative to expository text is not the main issue (Agius (Xuereb) & Zammit, 2021; Beerwinkle et al., 2018; Kraal et al., 2018), rather, students with dyslexia still need workbooks to include rich visual elements, a feature more typically embedded in narrative texts. This study found that incorporating more images and visual instructions could significantly reduce these barriers. However, practical considerations like space, cost, workbook weight, and printing constraints must be taken into account.

Students criticised the workbooks for having too much writing, insufficient imagery and colours, and many pages that are hard to work out. Workbooks lack activities targeted at students who learn at different rates and in various ways (International Dyslexia Association, 2017). The students felt more at ease when they knew what the story was about since they had already completed some pages in class, reflecting the benefits of literacy pre-training and vocabulary pre-teaching (Benton et al., 2023; Berne & Blachowicz, 2008). Students also suggested that workbooks should offer the option to work out half the questions and alternative ways to answer questions, such as drawing pictures or circling the correct word. This reflects the fact that in workbooks and even in exams, UDL practices and curriculum modifications are not always present or are inadequate, leading to students with LD facing content that may be too difficult or lengthy for them (Kohli et al., 2018).

Furthermore, none of the students mentioned the online additional material provided by Merlin Publishers with their workbooks (Merlin Publishers, 2018b). The lack of awareness or use of these additional online materials indicates a gap in the accessibility of these resources. Some students expressed a desire for flashcards to be used with the workbooks, with tactile aids such as dotted lines, to assist with spelling, highlighting a need for more accessible learning aids similar to those found in established reading

programmes like Read Write Inc. (Miskin, 2022; Partney School, 2023) and the Maltese Spelling Programme (Secretariat for Catholic Education [SfCE], 2023).

Lastly, design elements like small text, inadequate spacing between paragraphs and word banks, and the absence of paragraph numbers were cited as additional barriers. These issues, while partly related to design, are also deeply connected to the inherent difficulties of the Maltese language as a subject. This shows that some comments may be referring more to the content than how the information is presented and designed in the workbook. In fact, as Agius (Xuereb) and Zammit (2021) suggest, Maltese workbooks ought to be organised in a way that takes interventions like the Expository Text Structure Strategy into account. This intervention, which is beneficial for students with and without dyslexia, would help the students to better access, understand, and use a workbook, but it would not lessen Maltese language barriers.

Research Question 2: How can design principles be beneficial for students with LD when accessing textbooks?

When discussing design elements, students consistently preferred larger fonts, more spacing, and clear typographic hierarchies, such as bolded keywords and the structured layouts used in the adapted pages, which helped them navigate the text more easily. These preferences align with existing research that state that word and line spacing were found to be more helpful than letter shape and font style (Bachmann, 2013; Bachmann & Mengheri, 2018; Duranovic et al., 2018; Zikl et al., 2016; Zorzi et al., 2012).

Furthermore, the researchers suggest that the fonts recommended by BDA (2015; 2023) should be distributed and installed on all educational computers and shared with guardians to ensure consistency (BDA, 2023). To include all students and increase awareness, schools should follow the BDSG in all worksheets and internal correspondence. The BDSG document and design components, such as fonts, alignment, and paper, should also be given more importance in schools, official educational materials, and workbooks.

Students preferred the layout of the adapted pages since they found it helpful that there was more spacing and that sentences seemed shorter since they included 60 to 70 characters, as suggested by BDA (2023). Students also noticed the weight distinction (words in bold and different sizes), structure, and typographic hierarchy, with students preferring key facts and words in a list and boxes with difficult words, as suggested by the BDSG and graphic design guides. As Behbehani (2007) discussed, headlines and structure demonstrate how type size can capture the reader's attention. In fact, short lines, lists, and paragraph/line spacing are suggested and considered important aspects of accessible typography that can enhance legibility and readability (BDA, 2023; Behbehani, 2007; RGD, 2021; Science Graphic Design, 2022).

With regards to images, the majority of the students recognise the importance of visual help, as discussed in the BDSG (BDA, 2023) and the recommended design guidelines (Behbehani, 2007; Bohm, 2014; 2019; Brown, 2020; CAST, 2018a; RGD, 2021). In fact, the icons and images depicting an action were the most liked because they helped the students understand what the paragraph and story were about, validating CAST's claim (2018b). Image placement and the number of images used were also important, with the students stating that they find images placed next to the paragraphs and using more images as beneficial (BDA, 2023; RGD, 2021; Science Graphic Design, 2022).

The introduction of icons to explain instructions was particularly well-received, suggesting that visual symbols could be an effective tool in making workbooks more accessible. However, students expressed mixed preferences regarding text and background colours, with some favouring high-contrast combinations and others preferring more subdued options. This underscores the importance of offering customisable options to cater to individual needs.

Students also discussed the importance of practical aspects like binding and paper quality. They preferred thicker, matte paper and loose pages for easier handling, which aligns with BDSG recommendations. The study suggests that workbook publishers should consider these preferences in their production processes to enhance usability.

Research Question 3: In what ways can inclusive methods help students with LD to better access educational information in the everyday classroom?

As Dawson et al. (2019) and OCALI (2013) state, some of the participants viewed AT as a method that could help them feel more included and better access educational information. Some students found low-tech AT, like highlighter pens, useful for marking important text. In contrast, others emphasised the potential benefits of high-tech AT, such as computers, tablets, and interactive games. However, a lack of training in typing and digital skills was identified as a major barrier, with students expressing a strong desire for more practice in these areas.

The study highlights the need for a more integrated approach to ICT education in primary schools, ensuring that digital skills are taught consistently and inclusively. It also suggests that policymakers should consider providing free of charge digital copies of workbooks alongside printed versions, allowing students to choose the format that best suits their needs. The use of digital platforms, similar to software like Clicker8, could offer customisable options for font size, colour, images, and layout, making the content more interactive and accessible.

In addition to technology, students appreciated the option to answer questions in various formats, such as through recordings or drawings, which aligns with UDL principles.

They also favoured workbooks that allowed for a split comprehension approach, where stories are broken into parts with corresponding questions. However, they expressed a need for more differentiated learning options, including activities that require less writing and more visual elements.

The study concludes that while design principles and inclusive methods can greatly enhance accessibility for students with LD, not all elements are equally valued by students. Individual preferences play a significant role in determining which design and instructional strategies are most effective. Therefore, educational materials should offer a range of options to cater to diverse learning needs, ensuring that all students have the opportunity to succeed.

Conclusion

In this research, the researcher analysed how students with dyslexia view and feel about the content and the design elements in Maltese-language workbooks and adapted samples. Findings revealed that design principles affect how the workbook is presented and how students relate to and access educational information. Font size, visual help, imagery and icons, and spacing and layout were seen as the most helpful by the students, with colours and backgrounds, paper colour, paper thickness, and binding being discussed yet depending mostly on personal preferences. The most helpful elements were large (12-14pt) font size, images to support text, spacing between paragraphs, and a left aligned layout with short sentences. These aspects align with the BDSG (BDA, 2023) and the recommended guidelines for creating accessible and inclusive graphic design (RGD, 2021). Other aspects, which relied more on personal preferences, were also included in the guidelines mentioned above. While the guidelines stated that aspects like paper colour and background should be of a single colour with sufficient contrast, the students' colour preferences should first be taken into consideration (BDA, 2023).

Even though students with dyslexia noticed and found design elements helpful, barriers and difficulties were still discussed and present when accessing and using the workbooks. Thus, additional inclusive strategies were covered in the findings, such as AT, vocabulary pre-teaching, UDL principles, and multimodal question-answering in workbooks. Technology was discussed in line with typing and interactivity, with students expressing a need for typing practice and computer activities covering the content of the Maltese workbooks. These strategies indicated that such methods can be used to access Maltese workbooks better and include students with LD more comprehensively.

Based on the results attained, design principles and other inclusive methods influencing the access and inclusion of students with dyslexia were revealed, showing that the selected research tool was successful in producing the data needed to address the research questions. The active participation of students with dyslexia was a crucial component of the emancipatory research methodology applied in this study.

With the help of workbook designers, publishers, policymakers, schools, educators, and students, it is hoped that changes will be made to create more inclusive workbooks altogether, with importance given to online resources and graphic design for education. Lastly, a social/inclusive designer's job in education would be to include empathy, creativity, and equity into the curriculum to make sure that each student's journey is filled with worthwhile opportunities and experiences.

Notes on Contributors

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