

The Influence of Language Proficiency and Textbook in Understanding Science among Hearing Impaired Pupils

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Abstract

Students with special needs in hearing impairment (MBPK KP) often encounter language proficiency challenges, significantly impacting their understanding of Science subjects. They are provided with standard science textbooks, similar to the students in the mainstream classes. Therefore, this case study intends to question how their language skills and proficiency affect their understanding of science subjects as perceived by science teachers. Additionally, it investigates the use of science textbooks the government provides to assist teachers' efforts to enhance students' comprehension of science. This study employs a qualitative approach utilising a case study research design through interviews with four Science teachers from a Special Education school (SPK Pendengaran) in Kuala Lumpur. The findings reveal a consensus among Science teachers regarding the significant role of language skills proficiency in understanding Science subjects. Participants mentioned three challenges related to language encountered during science lessons and three instructional modifications to tailor the challenges. The second research question addresses the role of Science textbooks as the primary reference for lesson planning. Nevertheless, using self-developed teaching aids derived from the textbooks' content appears more comprehensible by MBPK KP. Nonetheless, science textbooks have been proven to be challenging to use for self-directed learning among MBPK KP, which underscores the need to propose five improvements to the language aspect of science textbooks.

Keywords: Language Skills, Hearing Impaired Students, Science Textbook, Science Education, Special Needs Students.

Introduction

Language is not just a tool for communication but a key to understanding the world around us. Language proficiency is crucial for individuals to effectively exchange ideas, foster community connections, cultivate cultural understanding, and achieve professional objectives in education, business, and politics. This is particularly true in science education, where a strong command of language is essential for comprehending complex scientific concepts. Individual language acquisition often commences organically throughout early

childhood through exposure to the primary language spoken in the social environment and the use of hearing as an effective means of acquiring linguistic skills. (Chomsky, 1965; Gomez, 2020).

The Science curriculum in Malaysia is designed with specific goals in mind. It aims to cultivate students who possess strong scientific literacy, are capable of innovation, can make informed judgements, and have problem-solving skills that can be applied to everyday situations. This is achieved through the mastery of scientific concepts and skills acquired during their education (KPM, 2017). Furthermore, the Science curriculum implementation also seeks to foster students' cultivation of a scientific mindset and ethical principles while promoting their active engagement in environmental conservation to address local, national, and global difficulties effectively. These goals provide the framework for investigating the influence of language skills proficiency and textbooks on understanding science among deaf and hard-of-hearing pupils (MBPK KP).

Students with hearing impairment, known as Murid Berkeperluan Pendidikan Khas (MBPK KP) at the Special Education School for the Deaf (SPK Pendengaran), rely heavily on textbooks for their science education. They follow the Science curriculum, which is identical in structure, learning materials, and assessment techniques to typical students in the mainstream classes. This implies that the students will acquire knowledge in science subjects through textbooks, which serve as their primary source of information. They will be assessed using classroom-based assessment methods like their peers without disabilities. The sole distinction lies in the instructional approach employed by the teacher during the implementation of the Science teaching and learning process within the classroom, explicitly utilising sign language as the preferred communication medium. (KPM, 2017). At SPK Pendengaran in Malaysia, two types of signal language media, namely Malay Language Hand Code, or Kod Tangan Bahasa Melayu (KTBM) and Malaysian Sign Language or Bahasa Isyarat Malaysia (BIM), are commonly used in the Science teaching and learning (PdP) process.

The rational justification for implementing the same Science curriculum for students with hearing impairment and typical students is based on the principle that all individuals have the right to a fair and equal education, without excluding anyone, including those with hearing impairments, as stated in the four goals of the Sustainable Development Goals (SDGs) plans presented by UNESCO in 2015.

Problem Statement

MBPK KP often experiences difficulties acquiring language, mainly spoken language, until they are provided with tools to assist the process, such as hearing aids or sign language instruction (Hoff, 2013). Language deprivation can adversely influence an individual's cognitive abilities Hallet al (2017), particularly concerning the development of comprehension skills in science courses learned in school.

Teachers in SPK Pendengaran also encounter difficulties when using the teaching and learning resource material provided by the Department of Education or Kementerian Pendidikan Malaysia (KPM), the textbook, as it is unsuitable for students with hearing impairments (MBPK KP). Textbooks and other reference materials available on the market are generally more student-friendly than KP MBPK. These resources are intended to be used by teachers and students to implement PdP effectively, as supported by (Villanueva et al., 2012; Muhamad & Yasin, 2022).

Prior research on language proficiency and educational materials among the MBPK population primarily concentrated on MBPK Pembelajaran (Learning Disabilities) rather than

MBPK KP. The anticipated outcomes of this investigation are poised to address two specific inquiries outlined in the study: How do language skills impact the comprehension of science subjects among MBPK KP students, as perceived by science teachers? Furthermore, in what manner did the textbooks supplied by KPM assist educators in moulding the comprehension of KP MBPK in the field of science?

Literature Review

Language Skills of MBPK KP

This study examined three theories regarding the acquisition of Language Skills among MBPK KP: the Theory of Language Acquisition proposed by Chomsky in 1965, the theory of language development put out by Halliday in 1975, and the theories of sociocultural cognitive development (Vygotsky, 1978).

Sign language is a visual communication employed by individuals with KP in everyday activities. It encompasses gestures made with the hands, motions of the body, and expressions on the face (Cheok et al., 2017). Typically, individuals with hearing impairment mainly utilise sign language as their first language, unlike regular individuals who primarily use spoken language (Ross et al., 2020). Sign language communication prioritises the visual reception of messages over adherence to grammatical rules (Bross, 2020). Additionally, sign language has a unique speech structure that differs from spoken language (Grove & Woll, 2017). This presents challenges for MBPK KP in converting the visual organisation of sign language into a written form that generally adheres to the structure of spoken language. They encountered a similar issue during a Science PdP session in the classroom, resulting in a decline in their proficiency in reading and writing (Ross et al., 2020).

Early exposure to language systems, such as sign language, is essential for enhancing children's preparedness to engage effectively in the learning process at school (Allen, 2015; Allen et al., 2014). It also aids in facilitating the learning process itself (Hall, Hall & Caselli, 2019; Henner et al., 2016; Hratinski & Wilbur, 2016). However, most MBPK KP individuals are experiencing delayed access to sign language or any other language system. Their formal exposure to language only begins when they attend school. The delay in developing language, communication, cognitive, and social skills among the MBPK KP is mainly attributed to the delayed detection of hearing issues and the subsequent delay in adopting early intervention measures (Nor & Rashed, 2018). The impact of developing a comprehensive understanding of MBPK KP in the academic domain, particularly science, will be influenced.

Therefore, proficiency in language skills is essential for the MBPK KP as it directly impacts the development of comprehension and academic performance, particularly in science subjects.

Influence and Importance of Language Skills in Academics

The SPK Pendengaran in Malaysia uses the Malay Language Hand Code (KTBM) and Signing Exact English (SEE) as the primary communication systems during classroom sessions (Jaafar et al., 2022). KTBM is the primary language MBPK KP uses during SPK hearings for academic communication. It shares the same linguistic patterns as the formal Malay language. A correlation exists between the reading abilities of non-native language pupils and their academic performance in mathematics and science (Stoffelsma & Spooren, 2019). In SPK Pendengaran, the second language utilised by MBPK KP after sign language is Malay.

Therefore, acquiring proficiency in reading abilities is crucial to enhancing academic performance in science courses studied at school.

Incorporating the reading skills component into the curriculum of the STEM (Science, Technology, Engineering, and Mathematics) subjects for non-native speakers is crucial. This integration aims to enhance the effectiveness of implementing the curriculum and to generate students' enthusiasm for delving deeper into STEM subjects. (Maarouf, 2019). Integrating language skills, particularly reading abilities, into the STEM curriculum has numerous benefits, particularly in enhancing student academic attainment (Dunn, 2017 & Tong et al., 2014). Regular reading routines can enhance students' academic achievement in STEM disciplines (Vuong et al., 2021) and enhance their opportunities to engage with scientific literature (Le et al., 2019). Ultimately, proficiency in linguistic abilities among the CPCs and solid reading skills are crucial for enhancing their academic prowess, particularly in science.

Influence of Teaching and Learning Materials of Science Subjects to MBPK KP

Teaching and learning material are a tool to convey information about the lesson's topic and achieve the intended learning objectives (Busljeta, 2013). Utilising suitable materials can amplify student enthusiasm and ignite their creativity, bolster students' existing knowledge, facilitate the learning process, and aid in developing skills and values during PdP sessions conducted by teachers (Busljeta, 2013). Teachers must exercise discernment when selecting appropriate materials and possess the ability to captivate students' attention, thereby fostering a heightened level of engagement during the PdP sessions they partake in (Cilliers, 2017). This is imperative since contemporary students possess distinct needs, learning styles, interests, skills, and motivations compared to students from earlier generations (Schwieger & Ladwig, 2018; Seemiller & Grace, 2017).

According to Alias et al (2019), MBPK KP in SPK Pendengaran follows the same curriculum, syllabus, and textbooks as regular primary school students. This ensures that MBPK KP also receives an equivalent quality education. However, the teachers at SPK Hearing are encountering a predicament because of a scarcity of reference materials and instructional resources, as well as their inability to fulfil the requirements of the PdP (Kahn & McGinnis, 2014; Abubleamah, 2018; Muhamad & Yasin, 2022). The MBPK KP at SPK Hearing encountered challenges due to their limited proficiency in reading and writing Pujaningsih et al (2021), which hindered their ability to comprehend and engage successfully in Science PdP sessions.

Resources are crucial in shaping one's comprehension of education, particularly in science. Hence, the Science textbooks supplied by KPM to SPK Pendengaran for the Science teachers and MBPK KP should be customised to meet their specific requirements, enhancing the MBPK KP's comprehension of the Science subject matter.

Research Objectives

This study explores the influence of language skills proficiency on the comprehension of science topics among MBPK KP in SPK Pendengaran, as seen by science teachers. Furthermore, this study aims to explore how the textbooks provided by the KPM assist teachers in moulding the understanding of the MBKK KP in science subjects.

Research Methodology

This research is a qualitative investigation conducted in the form of a case study. This approach was selected because it was appropriate for investigating the impact of language proficiency skills among MBPK KP and the influence of textbooks supplied by KPM to SPK Pendengaran on shaping the understanding of MBPK KP in science. Another determinant that impacted the choice of case study designs was the limited number of science subject teachers, which amounted to only four. In a qualitative study, the primary emphasis is not on having a large sample size but rather on ensuring that the sample is appropriate for collecting accurate results (Bowen, 2008).

The sampling technique employed in this study involves using a targeted sampling method. The Aims sampling method is a methodology used by researchers to select study participants based on their potential to provide the necessary data to answer a specific research issue (Obilor, 2023).

The study participants were four teachers who taught science topics in an SPK Pendengaran in Kuala Lumpur. They were identified as G1, G2, G3, and G4. All study participants were science teachers with significant expertise in conducting Science classes with MBPK KP. The SPK Pendengaran was selected as the research site because of the consistent underperformance of the MBPK KP in several assessments, especially in science subjects. It was discovered that the MBPK KP had deficiencies in their essential reading, writing, and counting proficiency, which negatively influenced their overall academic performance. Therefore, the researcher believed it was necessary to investigate how proficiency in MBPK KP language skills influences the comprehension and utilisation of textbooks in the context of PdP sessions, which solely emphasise science.

Research Instruments

The tool employed is a collection of semi-structured interview questions. Two sets of semi-structured interview procedure questions are given before the interview session. The interview questions for both sets align with the study's objective: to investigate the influence of language skills proficiency among MBPK KP and KPM-supplied textbooks on understanding science subjects among MBPK KP, as perceived by science teachers in SPK Pendengaran. Before conducting the interview session, the study participants provided oral consent.

The smartphone app captures interview sessions, facilitating the researcher's production of interview transcripts. If the participants' initial answers deviate from the intended scope of the study, additional inquiries (probes) are posed to steer their responses in the desired direction (Roulston & Choi, 2018). At the end of the interview, all participants were provided with an appropriate token as a gesture of gratitude for their time and valuable insights shared during the interview.

The purpose of transcribing the interview results was to facilitate the extraction of data from the responses provided by the study participants. The data was further analysed thematically, and the findings were then classified into two primary study topics.

Results

The study aimed to explore the influence of language skills, specifically reading and writing skills, on the comprehension of science subjects among the MBPK KP, as perceived by science teachers. Additionally, the study seeks to explore how the science textbooks offered by the KPM assist teachers in shaping students' comprehension of science subjects.

TABLE 1

Profile of the Research Participants

Participants' Code	GS1	GS2	GS3	GS4
Gender	Female	Male	Female	Female
Age	21 to 30 years old	31 to 40 years old	31 to 40 years old	31 to 40 years old
Duration of Service	Less than five years	11 to 20 years	11 to 20 years	11 to 20 years
Academic Qualifications	Bachelors Degree	Bachelors Degree	Masters Degree	Bachelors Degree

Exploring how Language Skills Influence The Understanding of Science Subjects among Mbpbk Pendengaran from The Perspective of Science Teachers

Language primarily influences students' comprehension in a PdP session. Therefore, it is crucial to examine the impact of language skills on comprehension across all subjects, including Science. The MBPK KP at SPK Pendengaran is required to study science just like other primary school students. Proficiency in language skills, particularly in reading and writing, significantly affects the development of students' comprehension in science subjects.

During interview sessions, four aspects were explored regarding the influence of language skills among MBPK KP in shaping their understanding of science subjects from the teacher's perspective: 1) the level of mastery in language skills proficiency among MBPK KP; 2) the importance of language skill in the formation of understanding among MBPK KP in science subjects; 3) the challenges faced by teachers from the language skill aspects of MBK KP to carry out the science PdP sessions; as well as 4) the need for instructional modification of language aspects during the implementation of Science PdP session with MBPK KP.

The Level of Mastery In Language Skills Proficiency Among MBPK KP

Based on the study, three participants expressed that the proficiency level of language skills among MBPK KP they taught are moderate to weak. The remaining participant, GS3, reported that the language skills proficiency among MBPK KP taught are weak. According to the interview results, GS3 mentioned that they taught Science subjects to lower primary-class students in MBPK KP. These students had just started their school session and had only received formal exposure to language skills for three years or less.

GS3: *Lower primary students are in the early stages of learning to read and write, so they are still developing their skills. Occasionally, science classes are adapted to teach the Malay language and sign language communication classes, as new students are keen on learning words such as animal names and their signs. On the other hand, upper primary students typically have a better grasp of reading and writing basics, although they still benefit from continued guidance from their teachers.*

GS1, GS2, and GS4 mentioned that they instruct upper primary MBPK KP students in science subjects. These students typically have at least three years of formal language skill exposure. The teachers noted that upper primary MBPK KP students generally acquire basic language skills during their lower primary years, resulting in more substantial reading and writing abilities than lower primary MBPK KP students.

The Importance of Language Skills in the Formation of Understanding Among MBPK KP in Science Subjects

All participants in the study emphasised the importance of language skills, particularly reading, in shaping their understanding of science as taught to individuals with hearing impairments. They stressed that without solid language skills, it is exceedingly challenging for MBPK KP to comprehend the lesson delivered by the teacher. Additionally, the study participants noted that the writing skills of MBPK KP were slightly weaker than their reading skills. This was attributed to the difficulty in hearing the sounds of letters and words when spelling. To write, these individuals need to memorise the spelling of each word because they cannot rely on the auditory component of language.

GS4: *MBPK KP often struggles with writing because they have to memorise the spelling of words. Even students who can differentiate between words may still make mistakes due to difficulties remembering the letter order in their writing words.*

GS2 contended that writing skills were not as crucial in shaping the comprehension of science subjects among MBPK KP as he believed students could effectively convey their understanding orally. Nevertheless, he did acknowledge the importance of writing skills for the year-end examinations taken by the upper primary students.

The Challenges Faced by Teachers from The Language Skill Aspects of MBPK KP To Carry Out the Science PdP Sessions

Based on the interview, science teachers at SPK Pendengaran encountered three challenges when conducting science teaching and learning sessions with MBPK KP. The first challenge pertains to the difficulty of implementing highly coordinated activities aligned with 21st Century Education Strategies (PAK-21), as articulated by GS1, GS2, and GS4. This difficulty arises from the need for substantial guidance from the teacher to help students comprehend the lesson in line with the requirements of MBPK KP. Furthermore, the teachers argue that a more traditional, teacher-centred approach to teaching and learning is more effective in developing students' understanding of MBPK KP in science subjects.

GS2: *I have attempted to introduce more challenging activities like Tarsia's puzzle during PdP sessions, but students encounter difficulties too often. Therefore, I am considering various teaching methods for effective learning, including a mix of traditional and modern approaches.*

Furthermore, science teachers at SPK Hearing often face time constraints when implementing PdP activities as outlined by GS1 and GS3. This is due to the need to provide extensive guidance to MBPK KP to ensure their comprehension of lesson content and completion of tasks such as worksheets. Additionally, addressing the significant disparity in language skills among MBPK KP in the class, as mentioned in GS2, poses a challenge. Some MBPK KP have a higher level of language proficiency than their peers, requiring teachers to allocate attention and time during Science PdP sessions efficiently.

GS1: *Teachers frequently struggle to complete all planned activities due to the need to support students extensively. Typically, only one out of two worksheets can be finished during a lesson, resulting in the need to carry over unfinished work to the next class.*

The third challenge faced by the teachers is the difficulty in establishing strong comprehension among MBPK KP to respond to subjective science questions and questions

requiring science processing skills (SPS) as defined by GS1 and GS4. This is because they may not fully understand the scientific terms in the questions and struggle to articulate their responses using the appropriate keywords. GS1 and GS4 have also noted that students struggle to answer subjective questions involving SPS due to weak reading skills, as they often cannot fully comprehend the questions. Consequently, science teachers must provide comprehensive guidance to the MBPK KP to ensure they can answer these questions accurately.

GS1: *Students frequently struggle with responding to questions regarding SPS when completing worksheets and exams. As a result, they often find it challenging to answer questions on worksheets and exams accurately.*

The Needs for Instructional Modification in Language Aspects During The Implementation of Science PDP Sessions With Mbpk Kp

All participants in the study acknowledged the necessity of making instructional adjustments regarding language when conducting a science PdP session with MBPK KP. This is essential to effectively support MBPK KP's learning needs in science subjects and ensure the creation of meaningful science learning experiences.

While implementing the science PdP, the four study participants made similar instructional modifications related to language. They utilised language adjustments and more concise sentence structures to enhance the comprehensibility of the teaching content for MBPK KP. Additionally, all study participants emphasised the effectiveness of using visual teaching aids (also known as Bahan Bantu Mengajar, BBM), such as images, videos, and natural objects, to support the MBPK KP's understanding of science concepts. They also noted that these aids helped improve language skills mastery.

GS3: Visual aids are essential for effective teaching. They significantly enhance students' understanding, mainly when covering complex topics like the process of photosynthesis. Teachers should rely on visual materials such as pictures and videos to facilitate learning and ensure student success.

Furthermore, according to the study participants, integrating repetition into the implementation of science PdP can facilitate the development of comprehension among MBPK KP in science subjects. Repeating the spelling of terms and definitions, providing relevant examples, and associating words with corresponding images during science PdP sessions could enhance the understanding and retention of the content taught.

GS2: *I reinforce learning by having students repeatedly sign and spell newly acquired terms. Additionally, I will encourage them to discuss today's lesson with their peers, fostering a deeper understanding of the topic.*

Teachers concur that language skills can significantly influence MBPK KP's comprehension of science subjects in SPK Pendengaran. Thus, proactive measures must be implemented to enhance MBPK KP's language skills proficiency. This will ultimately elevate their performance in science subjects and academics overall.

Exploring how The Textbooks Provided by The Kpm Assist Teachers in Moulding The Understanding of The Mbpk Kp In Science Subjects

MBPK KP in SPK Pendengaran uses the same curriculum, syllabus, and textbooks as students in mainstream classes. As a result, it is crucial for the textbooks supplied by KPM to SPK

Pendengaran to effectively support science teachers in building understanding among MBPK KP in science subjects.

The interview sessions with the study participants have delved into three key aspects: 1) the inclination of educators to utilise textbooks as the primary point of reference in conducting science, 2) the suitability of utilising science textbooks as a self-reference resource for MBPK KP, and 3) suggestions for improving the quality of science textbooks for teachers and MBPK KP in SPK Pendengaran.

The Inclination of Educators to Utilize Textbooks as The Primary Point of Reference in Conducting Science PdP

According to the interviews, all participants affirmed that the textbooks were the primary source of reference for planning lesson content in the classroom. They emphasised that the textbook content was instrumental in identifying the material to be taught to MBPK KP.

However, the participants in the study indicated that it was common practice not to use textbooks when facilitating a science PdP with MBPK KP in the classroom. Two factors influence the development of MBPK KP understanding in science PdP. The first factor is the complexity of the language structure, which, as noted by GS1, GS2, and GS4, is too challenging for MBPK KP to grasp. This includes using lengthy sentences and complex words, making it difficult for MBPK KP to comprehend the information.

***GS1:** It can be challenging for students to grasp the meaning of textbook sentences due to their length and complexity. Teachers play a crucial role in breaking down and explaining these sentences to ensure students can comprehend them more easily.*

Additionally, certain information is implied, as seen in certain textbook sections. For instance, GS2, GS3, and GS4 gave examples such as the use of comics, riddles and trivial questions like 'Test Your Mind' are used to convey lesson content. While these formats are intended to encourage critical and creative thinking among students, they are not deemed suitable for use on the MBPK KP. This is because the MBPK KP necessitates a clear and tangible approach to information delivery to ensure adequate comprehension and retention.

***GS4:** Our science textbooks often incorporate comics and riddles to stimulate critical thinking in students. However, many students may struggle to grasp these elements and often need comprehensive guidance from their teachers.*

Hence, educators at SPK Pendengaran typically customise their instructional resources, including slides and worksheets, using software like Canva and Microsoft PowerPoint. These materials are tailored to the content of the textbooks and are used during science PdP with MBPK KP. Creating materials that align with the students' learning abilities makes the teachers feel more at ease and believe this approach fosters a more profound understanding among the students.

***GS3:** I enjoy developing my educational materials by incorporating compelling visuals and relevant examples from everyday life. This approach enhances student engagement and understanding, making learning enjoyable and memorable.*

The Suitability of Utilizing Science Textbooks as A Self-Reference Resource for MBPK KP

The study participants unanimously agreed that the Science textbooks supplied by KPM were not well-suited for self-study by the MBPK KP when revising outside the classroom. This is due to the need for comprehensive guidance so that they can comprehend the textbook content.

As a result, the study participants mentioned they often offer handouts, such as concise notes and mind maps, for MBPK KP to use as reference materials.

GS2: I gave the students handouts containing notes and mind maps to assist them with their homework. Teachers must provide these materials to ensure students have a reliable reference point. Without these resources, students may struggle to comprehend the challenging textbook material, especially if they cannot find information online.

Suggestions for Improving the Quality of Science Textbooks for Teachers and MBPK KP in SPK Pendengaran

All the participants in the study have unanimously agreed that the Science textbooks used in SPK Pendengaran need to be improved to enhance their role as a critical resource for fostering understanding of MBPK KP in the subject of science. The study participants have put forth five proposals for improvement. Firstly, the Science textbook for MBPK KP's use needs to adopt a more concise and straightforward language configuration and structure, as GS1, GS2, and GS3 suggested. Secondly, the inclusion of sign language diagrams for each science term used in the textbook has been proposed for the reference of science teachers and MBPK KP, as recommended by GS1, GS3, and GS4.

Thirdly, developing a glossary or dictionary of terms, including sign language diagrams corresponding to the textbook content, is recommended to aid teachers and MBPK KP in understanding the terminology used, as mentioned by GS2 and GS3. Fourthly, creating a digital dictionary accessible via QR code scanning would expedite references for teachers and students, as suggested by GS2. Finally, it is crucial for the examples used in the textbooks to reflect local contexts familiar to MBPK KP, thus facilitating better understanding and connection to the material, as proposed by GS1, GS3, and GS4.

GS1: *I believe that our science textbooks should use language and words that are simpler and more concise to align with our students' comprehension levels. Including sign language diagrams is also vital to assist teachers and students when using textbooks. The examples presented in the textbooks should reflect situations commonly experienced by students, making it easier for them to connect with the concepts they are learning.*

GS2: *Incorporating a textbook section comprising sign language diagrams and corresponding meanings would greatly benefit students and teachers. Placing this dictionary at the back of the textbook with a QR code for easy access would allow students to scan and learn how to sign the words accurately.*

The textbook is crucial in assisting teachers in facilitating the development of understanding among MBPK KP in science subjects, particularly from a language perspective. Therefore, it is essential to enhance the presentation of textbook content from a language standpoint to improve its effectiveness for science teachers and MBPK KP in SPK Pendengaran.

Discussion

This research delves into the influence of language skills proficiency on MBPK KP students' comprehension of science subjects from the standpoint of science educators. It also examines the role of science textbooks provided by KPM in shaping MBPK KP students' understanding of science subjects. This study is crucial for enhancing the effectiveness of fostering

comprehension of MBPK KP students in science subjects at SPK Pendengaran. Specifically, it focuses on language proficiency and the educational resources used during science teaching and learning.

Exploring how Language Skills Influence The Understanding of Science Subjects Among Mbpk Pendengaran From The Perspective of Science Teachers

Four aspects were explored regarding the influence of language skills among MBPK KP in shaping their understanding of science subjects from the teacher's perspective: 1) the level of mastery in language skills proficiency among MBPK KP; 2) the importance of language skill in the formation of understanding among MBPK KP in science subjects; 3) the challenges faced by teachers from the language skill aspects of MBK KP to carry out the science PdP sessions; as well as 4) the need for instructional modification of language aspects during the implementation of Science PdP session with MBPK KP.

The study's results revealed that the language proficiency, particularly in reading and writing, of the MBPK KP students at SPK Pendengaran is low to moderate. This is primarily because most students only began formal language training when they enrolled. Consequently, they encounter delays in acquiring language skills, which can hinder their academic comprehension, including science subjects.

Delays in acquiring language skills can impact children's cognitive and social development. Early exposure to language skills, especially in reading and writing, is crucial for fostering a solid foundation for learning, including science subjects at school. Scholarly works such as those by Nor & Rashed (2018); Hall et al (2019); Henner et al (2016); Hratinski & Wilbur (2016) support this insight.

The study participants affirmed that language skills, particularly strong reading abilities, are essential for developing a deep understanding of science knowledge. This finding aligns with Allen's (2015); Allen et al.'s (2014) research, which revealed that proficiency in language skills significantly impacts the readiness of science students to engage more effectively in the learning process and excel academically.

Research participants have indicated that individuals with delayed language exposure typically struggle with spelling Hall (2017); Glickman & Hall (2018) due to their limited phonological awareness, which is typically developed through oral language experience (Alamargot et al., 2007; Sterne & Goswami, 2000; Aaron et al., 1998). As a result, their challenges in spelling can hinder their ability to master writing skills without the support of a teacher independently. Consequently, they often face difficulties in achieving proficiency in writing compared to their peers of the same age (Graham & Harris, 2011; Malik & Naseer ud Din, 2019).

Early exposure to a comprehensive language system, which includes sign language, can address this issue (Gardenforset al., 2019). Introducing sign language from a young age will enable MBPK KP to develop spelling skills through finger spelling and subsequently use them in written form during a science PdP session with a teacher at SPK Pendengaran.

The study participants mentioned that they faced three challenges related to language skills proficiency among MBPK KP during the implementation of the science PdP session. These challenges included time constraints, difficulty carrying out highly coordinated PdP activities (PAK-21) and forming the understanding of the MBPK KP through subjective and science process skills (SPS)-related questions. Considering the significant role of language in the learning process, it is understandable that proficiency in language skills poses excellent

challenges to science teachers at SPK Pendengaran when conducting effective PdP sessions for MBPK KP (Yusof et al., 2022; Zakia et al., 2017).

The study's results indicated that the participants recognised the necessity of modifying language instruction when conducting a science PdP session with MBPK KP in the classroom. According to the study participants, three instructional modifications were identified: using more straightforward and concise language and sentence structure, incorporating visual teaching aids (BBM), and utilising repetition techniques to enhance the effectiveness of the MBPK KP comprehension process during science PdP sessions with teachers.

It is crucial for science teachers to use simplified sentence structure during science PdP sessions with MBPK KP as they often struggle to understand and convey messages with complex language structures (Munawir et al., 2021). Additionally, the use of visual teaching aids has been proven to enhance the effectiveness of science teaching for MBPK KP (Mwila, 2019). Research has shown that visual aids can increase MBPK KP's interest in the content Hidayat et al (2020); Maryanti et al (2020), improve their understanding of abstract science concepts, and enhance their overall achievement in the subject (Agwu & Ogochi, 2019; Adebayo & Adigun, 2018). Furthermore, repeating teaching content can aid MBPK KP's comprehension, especially for those participating in science PdP sessions in the classroom (Baharuddin & Dalle, 2019).

Exploring How The Textbooks Provided By The Kpm Assist Teachers In Moulding The Understanding Of The Mbpk Kp In Science Subjects

The textbook is a kind of educational format that can be a source of knowledge for the reader (Falkner, 2018). It also plays a vital role in science education and is commonly used during science PdP sessions in the classroom (Kahveci, 2010). This study delved into three key aspects: 1) the inclination of educators to utilise textbooks as the primary point of reference in conducting science, 2) the suitability of utilising science textbooks as a self-reference resource for MBPK KP, and 3) suggestions for improving the quality of science textbooks for teachers and MBPK KP in SPK Pendengaran.

Science teachers at SPK Pendengaran rely on the textbooks provided by KPM as their primary source for developing their teaching content for the MBPK KP. This aligns with textbooks' role as crucial references that help educators establish educational objectives, determine pedagogical strategies, and ensure that the delivered teaching content aligns with the established standard learning curriculum (Lodhi et al., 2019).

However, it is also indicated that during Science PdP sessions with the KP MBPK, participants were less inclined to use the textbook due to its complex language and implicit information delivery. This hindered the textbook's role as a facilitator in transmitting information from the teacher to the student during classroom PdP sessions (Nurdyansyah & Arifin, 2018).

The study participants unanimously acknowledged the necessity for enhancements to the science textbooks provided by KPM for use by teachers and MBPK KP in SPK Pendengaran. This consensus aligns with a study by Pujaningsih et al (2021), which emphasised the crucial need to improve textbooks used for MBPK KP to support teaching and learning requirements in SPK Pendengaran. Evaluating and enhancing textbooks is vital to ensure their role as essential in improving science education, as Lodhi et al (2019) highlighted.

The study participants have proposed five suggestions for improvement. These include using more superficial language structures and incorporating sign language diagrams to

represent scientific terms. They recommend creating a glossary or dictionary of scientific terms and sign language diagrams based on textbook content. Additionally, they propose developing a digital dictionary of terms using QR code scanning and utilising examples and phenomena from local contexts commonly experienced by MBPK KP in everyday life.

The improvement proposals aim to enhance the quality and effectiveness of textbooks in developing the understanding of MBPK KP in science subjects. These proposals also align with the language skills level of MBPK KP in general. Implementing these improvements enhances the understanding of MBPK KP in science and supports the development of language skills through science PdP sessions with teachers in SPK Pendengaran. The aim is to make textbooks a facilitative medium in science education, improving the quality of science education at SPK Pendengaran and creating a more meaningful learning experience for MBPK KP in science subjects.

Conclusions

The proficiency of language skills and the Science textbooks provided by KPM have significantly influenced the understanding of science subjects taught by the science teachers in SPK Pendengaran. It is imperative to address these aspects proactively to maintain the quality of science education in SPK Pendengaran and ensure their continued excellence. The study's findings underscore the necessity for initiatives to enhance language skills proficiency among MBPK KP and improve science textbooks' quality through thorough review and adjustment of its content and presentation. The ideas presented in this research also make a substantial contribution to the existing body of knowledge by providing valuable theoretical insights and practical implications. These findings are crucial for enhancing language proficiency and optimizing the role of science textbooks during science PdP in SPK Pendengaran.

References

- Aaron, P. G., Keetay, V., Boyd, M., Palmatier, S., & Wacks, J. (1998). Spelling without phonology: A study of deaf and hearing children. *Reading and Writing*, pp. 10, 1–22.
- Abubleamah, Y. A. S. (2018). *Difficulties Facing the Elementary Deaf Students in Learning English as a Foreign Language in Gaza Deaf Schools* (Doctoral dissertation).
- Adebayo, O. O., & Adigun, S. Q. (2018). Impact of instructional aids on students' academic performance in Physics in secondary schools In Federal Capital Territory (FCT) Abuja, Nigeria. *European Scientific Journal, ESJ*, 14(4), 366-376.
- Agwu, S. N., & Ogochi, M. A. (2019). Assessing The Effect of Visual Aids on Secondary School Students' Achievements in Learning English Language In Agbani Education Zone Of Enugu State, Nigeria. *Advance Journal of Education and Social Sciences*, 4(10).
- Alamargot, D., Lambert, E., Thebault, C., & Dansac, C. (2007). Text composition by deaf and hearing middle-school students: The role of working memory. *Reading and Writing*, 20, 333-360.
- Alias, U. K., Ishak, H., & Mohamad, S. (2019). Kaedah-kaedah bacaan al-Quran dalam kalangan orang kurang upaya pendengaran. *AL-TURATH JOURNAL OF AL-QURAN AND AL-SUNNAH*, 4(2), 59-67.
- Allen, T. E., Letteri, A., Choi, S. H., & Dang, D. (2014). Early visual language exposure and emergent literacy in preschool deaf children: Findings from a national longitudinal study. *American Annals of the Deaf*, 159(4), 346–358.

- Allen, T. E. (2015). ASL skills, fingerspelling ability, home communication context and early alphabetic knowledge of preschool-aged deaf children. *Sign Language Studies*, 15(3), 233–265.
- Baharuddin, B., & Dalle, J. (2019). Transforming learning spaces for elementary school children with special needs. *Journal of Social Studies Education Research*, 10(2), 344–365.
- Bowen, G. A. (2008). Naturalistic inquiry and the saturation concept: a research note. *Qualitative research*, 8(1), 137–152.
- Bross, F. (2020). *The clausal syntax of German Sign Language: A cartographic approach (Volume 5)*. Language Science Press.
- Bušljeta, R. (2013). Effective use of teaching and learning resources. *Czech Polish historical and pedagogical journal*, 5(2).
- Cheok, M. J., Omar, Z., & Jaward, M. H. (2019). A review of hand gesture and sign language recognition techniques. *International Journal of Machine Learning and Cybernetics*, 10, 131–153.
- Chomsky, N. (1965). 1971. *Aspects de la théorie syntaxique*.
- Cilliers, E. J. (2017). The challenge of teaching Generation Z. *PEOPLE International Journal of Social Sciences*.
- Dunn, J. (2017). STREAM: Science, Technology, Reading, Engineering, Arts, and Math: Integrating STEAM and Reading. Presented at the Paper ISTE Conference in San Antonio, Texas.
- Falkner, A. (2018). Racialized space and discourse in the picture books of Ezra Jack Keats. *The Journal of Social Studies Research*, 42(2), 171–184.
- Gardenfors, M., Johansson, V., & Schönström, K. (2019). Spelling in deaf, hard of hearing and hearing children with sign language knowledge. *Frontiers in Psychology*, 10, 475190.
- Glickman, N. S., & Hall, W. C. (Eds.). (2018). *Language deprivation and deaf mental health*. Routledge.
- Gómez, A. M. (2020). *Age and input effects in the acquisition of clitic climbing constructions in heritage and second language (L2) Spanish* (Doctoral dissertation, Purdue University).
- Graham, S., & Harris, K. R. (2020). Writing and students with learning disabilities. In *Handbook of Educational Psychology and Students with Special Needs* (pp. 487–509). Routledge.
- Grove, N., & Woll, B. (2017). Assessing language skills in adult keyword signers with intellectual disabilities: Insights from sign linguistics. *Research in developmental disabilities*, 62, 174–183.
- Hall, W. C. (2017). What you don't know can hurt you: The risk of language deprivation by impairing sign language development in deaf children. *Maternal and Child Health Journal*, 21(5), 961–965.
- Hall, W. C., Levin, L. L., & Anderson, M. L. (2017). Language deprivation syndrome: A possible neurodevelopmental disorder with sociocultural origins. *Social psychiatry and psychiatric epidemiology*, 52, 761–776.
- Hall, M. L., Hall, W. C., & Caselli, N. K. (2019). Deaf children need language, not (just) speech. *First Language*, 39(4), 367–395.
- Halliday, M. A. K. (1975). Learning how to Mean in Hodder Arnold. Google Books.
- Hidayat, D. S., Rahmat, C., Fattah, N., Rochyadi, E., Nandiyanto, A., & Maryanti, R. (2020). Understanding Archimedes law: What the best teaching strategies for vocational high school students with hearing impairment. *Journal of Technical Education and Training*, 12(1).

- Hoff, E. (2013). *Language Development*. Wadsworth Publishing Company.
- Israr, A. (2021). Importance of language in our life. From <https://www.marstranslation.com/blog/importance-of-language-in-our-life>
- Jaafar, M. A., Yusof, N. M., Nor, M. F. M., Razalli, A. R., & Jaafar, A. N. M. (2022). Sign Language Hand Code Training as an Early Intervention Program for Year One Pupils with Hearing Impairment in Ipoh, Perak: A Case Study: Latihan Kod Tangan Bahasa Isyarat sebagai Program Intervensi Awal bagi Murid Kurang Upaya Pendengaran Tahun 1 di Ipoh, Perak: Satu Kajian Kes. *Jurnal Pendidikan Awal Kanak-kanak Kebangsaan*, 11(2), 78-89.
- Kahn, S. (2023). Special Needs and Talents in Science Learning. In *Handbook of Research on Science Education* (pp. 325–358). Routledge.
- Kahveci, A. (2010). Quantitative analysis of science and chemistry textbooks for indicators of reform: A complementary perspective. *International Journal of Science Education*. 32(11):1495–1519.
- Kementerian Pendidikan Malaysia. (2017). *Dokumen Standard Kurikulum dan Pentaksiran Sains Tahun Enam*. Putrajaya: Malaysia.
- Kementerian Pendidikan Malaysia. (2017). *Dokumen Standard Kurikulum dan Pentaksiran Bahasa Isyarat Komunikasi Tahun Enam*. Putrajaya: Malaysia.
- Le, T. T. H., Tran, T., Trinh, T. P. T., Nguyen, C. T., Nguyen, T. P. T., Vuong, T. T., Vu, T. H., Bui, D. Q., Vuong, H. M., Hoang, P. H., Nguyen, M. H., Ho, M. T., & Vuong, Q. H. (2019). Reading Habits, Socioeconomic Conditions, Occupational Aspiration and Academic Achievement in Vietnamese Junior High School Students. *Sustainability*, 11(18), 5113.
- Lodhi, M. A., Farman, H., Ullah, I., Gul, A., Tahira, F., & Saleem, S. (2019). Evaluation of English Textbook of Intermediate Class from Students' Perspectives. *English Language Teaching*, 12(3), 26-36.
- Maarouf, S. A. (2019). Supporting Academic Growth of English Language Learners: Integrating Reading into STEM Curriculum. *World Journal of Education*, 9(4), 83-96.
- Malik, M. (2019). Writing Skills Development among Students with Deafness at Elementary Level. *Bulletin of Education and Research*, 41(1), 1–16.
- Maryanti, R., Hufad, A., Sunardi, S., Nandiyanto, A. B. D., & Al-Obaidi, A. S. M. (2020). Understanding Covid-19 particle contagion through aerosol droplets for students with special needs. *Journal of Engineering Science and Technology*, 15(3), 1909-1920.
- Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis*. SAGE.
- Muhamad, N. F., & Yasin, M. H. M. (2022). Pengaruh Sumber Pengajaran Mata Pelajaran Sains MBK Pendengaran. *Jurnal Dunia Pendidikan*, 4(1), 292-304.
- Mwila, P. (2019). *Bachelor of Education Programmes Offered in Private Universities in Tanzania Within the Framework of the Inter-university Council of East Africa: Internal Stakeholders' Eye on Quality of Their Products*. GRIN Verlag.
- Nor, S. M., & Rashed, Z. N. (2018). Peranan dan cabaran guru-guru pendidikan khas membentuk kemenjadian murid-murid masalah pendengaran dalam abad ke 21. *Journal of Quran Sunnah Education & Special Needs*.
- Nurdyansyah, N., & Arifin, M. B. U. B. (2018, January). Integration of Islamic values in elementary school. In *1st International Conference on Intellectuals' Global Responsibility (ICIGR 2017)* (pp. 190-192). Atlantis Press.
- Obilor, E. I. (2023). Convenience and purposive sampling techniques: Are they the same? *International Journal of Innovative Social & Science Education Research*, 11(1), 1-7.

- Olson, M. (2010). Document analysis. In Mills, A. J., Durepos, G. & E. Wiebe (Eds.), *Encyclopedia of Case Study Research* (pp. 319–321). California: SAGE Publications, Inc.
- Pujaningsih, P., Wahab, R., & Praptiningrum, N. (2021). Barriers in teaching science to students with special needs: Exploration from teachers' perspectives. *KnE Social Sciences*, 532-551.
- Ross, A., Yerrick, R., & Pagano, T. (2020). Use of Scientific Argumentation by Deaf/Hard-of-Hearing Students in Environmental Science Topics. *Journal of Science Education for Students with Disabilities*, 23(1), 5.
- Roulston, K., & Choi, M. (2018). Qualitative interviews. *The SAGE handbook of qualitative data collection*, pp. 233–249.
- Saldaña, J., & Omasta, M. (2016). *Qualitative research: Analyzing life*. Sage Publications.
- Sandler, W., & Lillo-Martin, D. C. (2006). *Sign language and linguistic universals*. Cambridge University Press.
- Schwieger, D., & Ladwig, C. (2018). Reaching and retaining the next generation: Adapting to the expectations of Gen Z in the classroom. *Information Systems Education Journal*, 16(3), 45.
- Seemiller, C., & Grace, M. (2017). Generation Z: Educating and engaging the next generation of students. *About Campus*, 22(3), 21–26.
- Sterne, A., & Goswami, U. (2000). Phonological awareness of syllables, rhymes, and phonemes in deaf children. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, 41(5), 609–625.
- Stoffelsma, L., & Spooren, W. (2019). The relationship between English reading proficiency and academic achievement of first-year science and mathematics students in a multilingual context. *International Journal of Science and Mathematics Education*, 17, 905-922.
- Tong, F., Irby, B. J., Lara-Alecio, R., & Koch, J. (2014). Integrating literacy and science for English language learners: From learning-to-read to reading-to-learn. *The Journal of Educational Research*, 107(5), 410–426.
- United Nations Development Group. (2015). The 2030 agenda for sustainable development.
- Vuong, Q. H., Nguyen, M. H., & Le, T. T. (2021). Home scholarly culture, book selection reason, and academic performance: Pathways to book reading interest among secondary school students. *European Journal of Investigation in Health, Psychology and Education*, 11(2), 468-495.
- Vygotsky, L. S., & Cole, M. (1978). *Mind in society: Development of higher psychological processes*. Harvard University Press.
- Yusuf, M., Adriyanto, F., Priyono, P., & Rahman, A. (2022). Pedagogical Problem Faced by Teachers in Communication and Language Learning for Deaf Students in Special Schools. In *3rd Progress in Social Science, Humanities and Education Research Symposium (PSSHRS 2021)* (pp. 15-27). Atlantis Press.
- Yusuf, M., Adriyanto, F., & Zakiah, W. G. (2021). Problem Of Sentence Structure of Children With Hearing Impairment In Elementary School. In *Proceedings of International Conference on Special Education* (Vol. 4).
- Zakia, D. L., Sunardi, S., & Yamtinah, S. (2017). The study of visual media use on deaf children in science learning. *European Journal of Special Education Research*.