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Development and Validation of BaResDI: A Diagnostic Tool for Primary Remedial Reading Programs

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Abstract. This study aims to develop the Basic Reading Skills Diagnostic Instrument (BaResDI) for Primary School Remedial Education Program. A combination of qualitative and quantitative research designs was employed in the study. The qualitative approach was used to develop the BaResDI, while the quantitative approach was utilized to assess the validity and reliability of the BaResDI. The study was guided by the five steps in Cognitive Diagnostic Model (Nichols, 1994). These five steps include substantive construct theory, design selection, test administration, response scoring and test review. The construction and development of BaResDI items were carried out qualitatively using a library research approach, referencing credible and authoritative sources from the Ministry of Education Malaysia. The study sample comprised five experts with experience in special remedial education, eight remedial teachers, and 30 remedial students from eight primary schools in Sarawak. The findings showed that BaResDI had a high content validity with a content validity coefficient of 0.96. BaResDI was then administered to 30 remedial students in Sarawak during the pilot phase. The pilot findings were analysed to evaluate the internal consistency of BaResDI. The internal consistency evaluation revealed that BaResDI had a high reliability level with a KR-20 value of 0.98. In conclusion, the development and validation of BaResDI align with the steps of Cognitive Diagnostic Model (Nichols, 1994) and positively impact the quality of teaching and learning of the Malay language in the context of primary school remedial education. This study contributes to the improvement of diagnostic assessment tools in literacy education, particularly in the Malay language context.

Keywords: Malay language; diagnostic instrument; primary school; reading skills; remedial education

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1. Introduction

Education has become a decisive factor for social integration and personal growth (Rakhimzhanova et al., 2025). The World Bank report published in April 2024 revealed that 148,284 primary school students nationwide were facing reading difficulties at the end of 2022. In 2024, it was reported that 42% of students in Malaysia were still unable to master reading skills well, the data presented is based on the population of students from Year 1 to Year 5 in Malaysia (World Bank, 2024). Reading problems certainly have an impact on students' ability to achieve good results in all subjects including Malay Language (Balanadam & Jamaluddin, 2021). The problem of reading skills mastery also causes concern among educators and needs to be addressed immediately to ensure that students can successfully follow the learning process (Mahamod et al., 2021).

An approach needs to be developed to assist teachers in conducting teaching and learning for students who are weak in mastery of reading skills. The student aspirations in the Malaysian Education Blueprint (MEB) 2013-2025 outline that every student needs to fully master literacy skills which are the key to mastering other disciplines in the world of education (Ministry of Education Malaysia, 2013). Quoting a statement by former Senior Minister of Education Dr Radzi Jidin in *Sinar Harian*, the Ministry of Education is working to realize the final wave of the MEB 2013 - 2025.

The final wave of the MEB 2013 - 2025 focuses (Karuppannan et al., 2023) more on the shift towards excellence with increased operational flexibility. The implementation of the action plan in the MEB 2013 - 2025 expresses a high desire to produce students who are knowledgeable, have thinking skills, language skills, leadership abilities, and are ethical and have high spiritual values and a strong national identity (Bernama, 2021). Mastery of reading skills is certainly needed as the main foundation for the success of the final wave of the MEB (Hasan, 2020).

MEB shows how the government seriousness in addressing the reading difficulties among the students by prioritising early literacy interventions and enhancing teacher training in literacy instruction (Karuppannan et al., 2023). Various intervention programs have been implemented since the 1960s to help primary school students who have problems mastering the basic skills of reading, writing and arithmetic (Special Education Division, 2019). The government's efforts in eradicating the issue of mastery the reading and writing skills are clearly demonstrated through the implementation of various Education Development Plans such as the Education Development Master Plan 2006 - 2010 which, among others, aims to bridge the education gap and ensure that students master the basic reading and writing skills at level one of primary school (Ministry of Education Malaysia, 2006).

Efforts to improve the basic reading and writing skills are still being actively implemented to this day, but the problem is still surrounds the country's education world. Data shows that a total of 122,062 pupils in Year One have not mastered in basic reading, writing, and mathematics skills after three months of schooling (Khadir, 2024). Another data also shows that 62,928 Year One pupils

have not mastered literacy and numeracy skills (Marzuki, 2024). The figures shown are indeed quite large and worrying.

Innovative educational approaches should be explored to improve the learning of pupils' performance (Ajilouni et al., 2025). Thus, the accurate diagnostics are essential to ensure that interventions carried out by remedial education teachers are focused on the real difficulties faced by students (Saidin & Bukhari, 2023). Current diagnostic instruments tend to focus heavily on summative evaluation, offering limited insights into learners' underlying challenges in phonology, morphology, vocabulary, and syntactic comprehension. Recent studies further highlight these gaps. For instance, the Early Reading Assessment Battery for multilingual learners in Malaysia demonstrates the value of structured diagnostic tools but was developed primarily for mainstream early readers rather than remedial populations (Lee et al., 2020). Similarly, percentile norms established for Malay early reading assessments remain unsuitable for identifying specific deficits among struggling readers (Lee et al., 2022).

A 2024 literature review on Malay language teaching practices reveals that teachers continue to rely on generic assessments lacking diagnostic depth, limiting their ability to design targeted interventions (Yaacob and Mohd Rashid 2024). These gaps underscore the need for a systematically developed BaReSDI that addresses early detection of learning challenges, and informs targeted instructional planning for reading skills. Development of Basic Reading Skills Diagnostic Instrument (BaReSDI) grounded in empirical evidence and aligned with the primary school national curricular of Malay language, would contribute significantly to enhancing remedial education effectiveness and improving learning outcomes for struggling Malay language learners.

Based on the statistics and recommendations presented by previous researchers, leads to the development of BaReSDI. This development and validation study is very significant as an effort to improve the reading skills among students, especially remedial education students. The diagnostic test that was built is intended to be used in the process of detecting areas of weakness of remedial education students in mastering reading skills. This detection process is very important to enable remedial teachers to provide the best and most effective interventions to help remedial education students master basic reading skills successfully. Three research questions in this study are; (1) How is BaReSDI developed?; (2) What is the validity of BaReSDI?; and (3) What is the reliability of BaReSDI? Hence, this study is hoped to contribute in enhancing literacy skills among Malaysian primary student because reading skills is the foundation to master the literacy skills.

2. Literature Review

2.1 Reading Skills

Reading skills are one of the important basic skills that must be mastered by every student (Ministry of Education Malaysia, 2017). Reading goes through two main processes, namely translating written or printed symbols into language sounds and obtaining information or meaning from spoken language sounds (Awang &

Samin, 2010). Reading is a process that begins with recognizing letter sounds, syllables, reading meaningful words, then reading phrases and sentences starting with simple sentences to more difficult and complex sentences (Ahmad & Othman, 2020). Reading skills also involve readers to understand ideas according to experience, needs and the purpose of reading through a thinking process that uses mental power in translating graphic symbols (writing) into intellectual concepts (Mohamad et al., 2013). Reading highlights three main aspects, namely recognition, interpretation and perception of printed or written materials which involve the reader's cognitive processes (Giesen, 2009).

The failure of remedial education students to master reading skills is due to their failure to master reading skills at the most basic level, namely the skills of recognizing letters, reading open syllables and their pattern words (Jouse et al., 2024). Remedial education teachers play an important role in providing teaching and learning that can meet the needs of students and can help students to overcome the difficulties, especially in mastering basic reading skills (Hasan, 2020). In short, reading is a complex process because it needs to go through certain phases before being translated through voice or sound. Reading skills are a mentalist process that tests the reader's intellect to understand and translate printed or written reading materials meaningfully.

2.2 Remedial Education Program

Remedial education program is an educational program carried out by the Ministry of Education in all National and National Type Schools nationwide. Remedial education program is specifically designed for students who have difficulty mastering the basic skills of reading, writing and arithmetic (Ministry of Education Malaysia, 2019).

A remedial education teacher is a teacher who is specially trained in the field of remedial education at the Teacher Education Institute, public universities or foreign universities. Remedial education teachers are trained in handling remedial education programs in schools and are able to carry out interventions for students who have difficulties in mastering the reading, writing, and arithmetic skills (Special Education Division, 2012). The placement of remedial education teachers in a school is based on a ratio of one teacher for 15 students (Sulaiman, 2019). Remedial education students are facing difficulties in mastering reading, writing and arithmetic skills, might be negative towards learning, have personalities and behaviors that can affect learning (Ministry of Education Malaysia, 2019).

Overall, the education program is an effort by the Ministry of Education to address the issues in mastering basic reading, writing and arithmetic skills among students nationwide. The implementation of the remedial education program is carried out in a structured manner. It will certainly bring benefits to all students within the framework of eradicating the problem of mastering basic skills.

3. Methodology

The study was conducted by using a combination of qualitative and quantitative designs. This combination of designs is required in the implementation of research on the construction of diagnostic instruments (Yuznaili, 2016). Qualitative design with a library research approach was used in the construction process of BaReSDI, while quantitative design was used in the process of assessing the validity and reliability of BaReSDI.

Library research is a research method used to obtain data through a study of existing documents and records (Shaffie, 1991). Library research is a method that can be used in the field of education by examining resources available in libraries such as books, articles, journals and various other documents to obtain data and information needed in a study (Arcanita et al., 2023). Library research is carried out to determine the direction of the study and obtain information regarding the vocabulary of knowledge being studied (Sudirman & Hamid, 2016). The statements above are the justification for the researcher choosing the library research approach as part of the study implementation design.

The design of the literature study was used by the researcher to answer the first research question, which is how to develop BaReSDI. The literature study was also conducted by exploring literature from authentic and authoritative sources such as the findings of previous researchers and official documents published by the Ministry of Education. The analysis of the findings of previous researchers as well as the Malay Language curriculum documents and the remedial education program issued by the Ministry of Education was carried out to identify the constructs and items that need to be included in BaReSDI. Each process in the BaReSDI development phase will be detailed descriptively and structured in the reporting of the study findings.

A quantitative approach was used to analyze the validity and reliability of BaReSDI. The validity assessment process was conducted using the expert reference method while the reliability assessment was conducted using the BaReSDI internal consistency assessment method, which will be discussed in depth in the data analysis procedures. The implementation of the study was based on the Cognitive Diagnostic Model (Nichols, 1994). This model is a suitable model and is widely used in the construction of diagnostic tests (Yuznaili, 2016). Based on this model, there are five steps in the process of developing a diagnostic test, namely substantive theoretical constructs, design selection, test administration, response scores and design review. Figure 1 illustrates the stages of Nichols' Cognitive Diagnostic Model in the study.

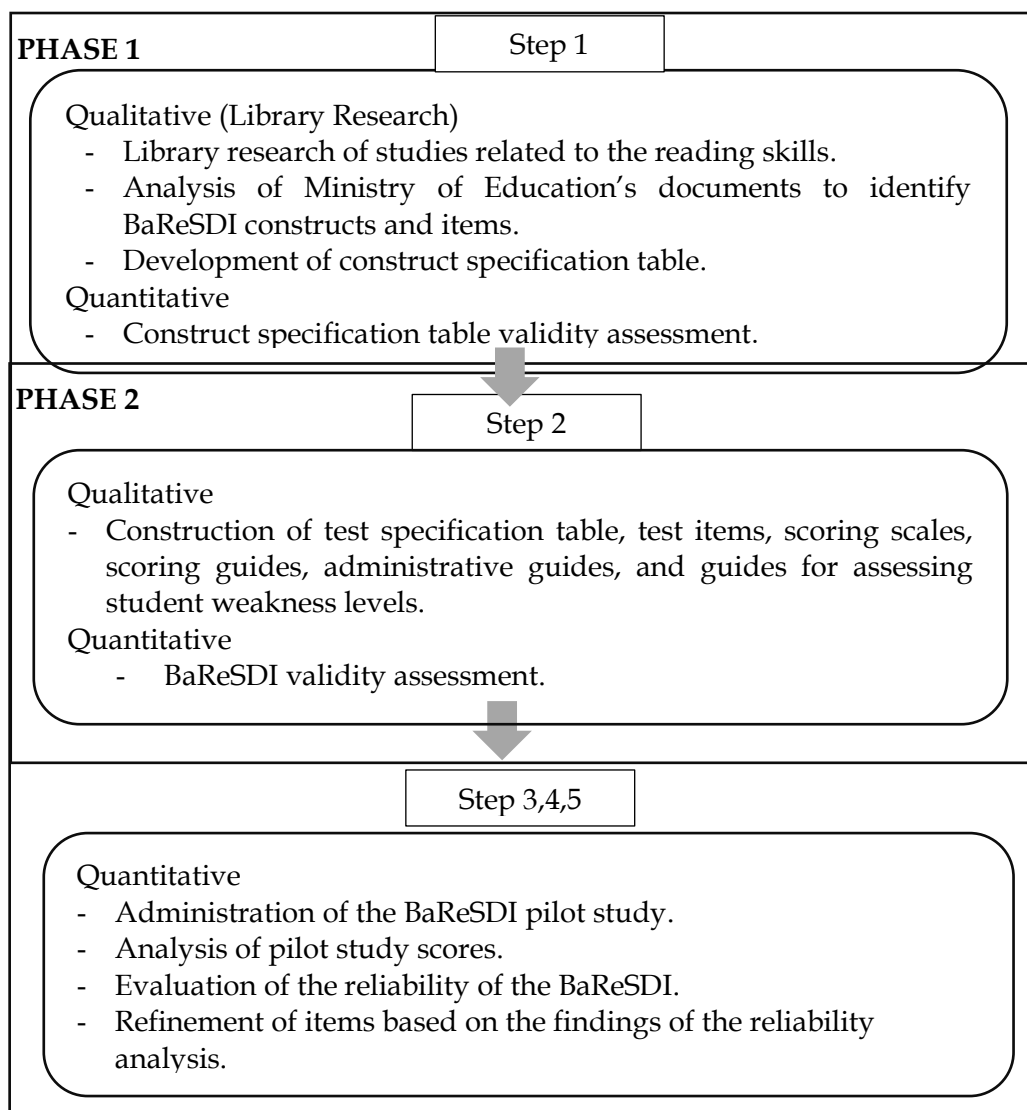


Figure 1: Stages of Cognitive Diagnostic Model (Nichols, 1994) in the study

3.1 Data Collection

The sample involved in the implementation of the study are remedial education students, remedial education teachers, and individuals directly involved in the planning and implementation of the remedial education program. The sampling method used is the purposive sampling method. The number of participants involved in the study was 43 participants consisting of five experts in the field of remedial education, 30 remedial education students and eight remedial education teachers. The data collection procedure involved two phases in the study. Details regarding the data collection procedure based on the two phases and steps of the study implementation will be discussed. Data collection in phase one of the study consisted of qualitative and quantitative data collection. Phase one consisted of the first and second steps in Cognitive Diagnostic Model (Nichols, 1994), namely the substantive theoretical construct and the design selection.

In the first phase of the study, qualitative data was collected through library research involving literature on reading skills and Ministry of Education's official documents, such as curriculum standards, guidebooks, and textbooks. The findings were used to identify the necessary constructs for the development of the BaReSDI. Based on these findings, the researcher drafted the construct specification table, which was then validated by five experts. This construct specification table served as the foundation for the second phase, which involved designing the test specification table, developing BaReSDI items, creating administration and scoring guides, and establishing student weakness assessment scales. Once the instrument was developed, its validity was evaluated by five experts, focusing on construct, face, and content validity.

Phase two of the study was guided by the Cognitive Diagnostic Model (Nichols, 1994), covers the third to fifth steps and involves quantitative data collection to determine the reliability of BaReSDI through a pilot study. The third step, test administration, involves piloting the validated BaReSDI instrument. Prior to the pilot study, the researcher obtained approval from the Ministry of Education's Policy Planning and Research Division to conduct the study in Sarawak. The pilot study involved 30 remedial education students from eight schools, with remedial education teachers receiving a briefing on implementation of BaReSDI. These teachers then administered the instrument according to the guidelines and assessed students using a scoring scale that has been validated by experts.

3.2 Data Analysis

Phase one of the study involves both qualitative and quantitative data collection to guide the design and development of BaReSDI. Qualitative data, obtained from library research using authoritative sources such as Ministry of Education documents, academic articles, and relevant books, supports the identification of constructs and item development. To ensure validity, the researcher employs triangulation data by referencing at least three key documents—such as the Remedial Education Program Implementation Guidelines, Curriculum and Assessment Standard Document, and Malay Language textbook—for each construct. Additionally, expert evaluations of the constructs, items, and administration guidelines further validate the qualitative data. Quantitative data in this phase includes expert ratings collected during the BaReSDI content validity assessment. These ratings were analyzed to calculate an average percentage score, where a value of 70% (0.7) or higher indicates a high level of content validity.

Data obtained from a pilot study of the use of BaReSDI conducted on 30 students will be used in the process of assessing the reliability of BaReSDI. The data collected through the pilot study is the scores of remedial education students. The scores of the participants in the pilot study were recorded in the Student Mastery Reporting Form and the scores are dichotomous, where a score of one means that the student has mastered the skill being tested and a score of zero means that the student has not mastered the skill being tested. The scores that were recorded in the Student Mastery Reporting Form were used in the BaReSDI reliability analysis procedure. The analysis of reliability is an internal consistency assessment of the

BaReSDI. The analysis method used was the Kuder Richardson reliability method since the dichotomous scale is involved.

4. Results and Findings

4.1 Development of BaReSDI

The first research question is: How was BaReSDI developed? To answer this research question, the researcher has identified a suitable model to be used as a basis in developing the BaReSDI. Library research was conducted to explore previous studies regarding the development of diagnostic tests. As a result of the library research, the researcher found that the Cognitive Diagnostic Model (Nichols, 1994) is a suitable model to be used as a foundation in the BaReSDI development process. Figure 2 shows the flow of the process and phases of BaReSDI development.

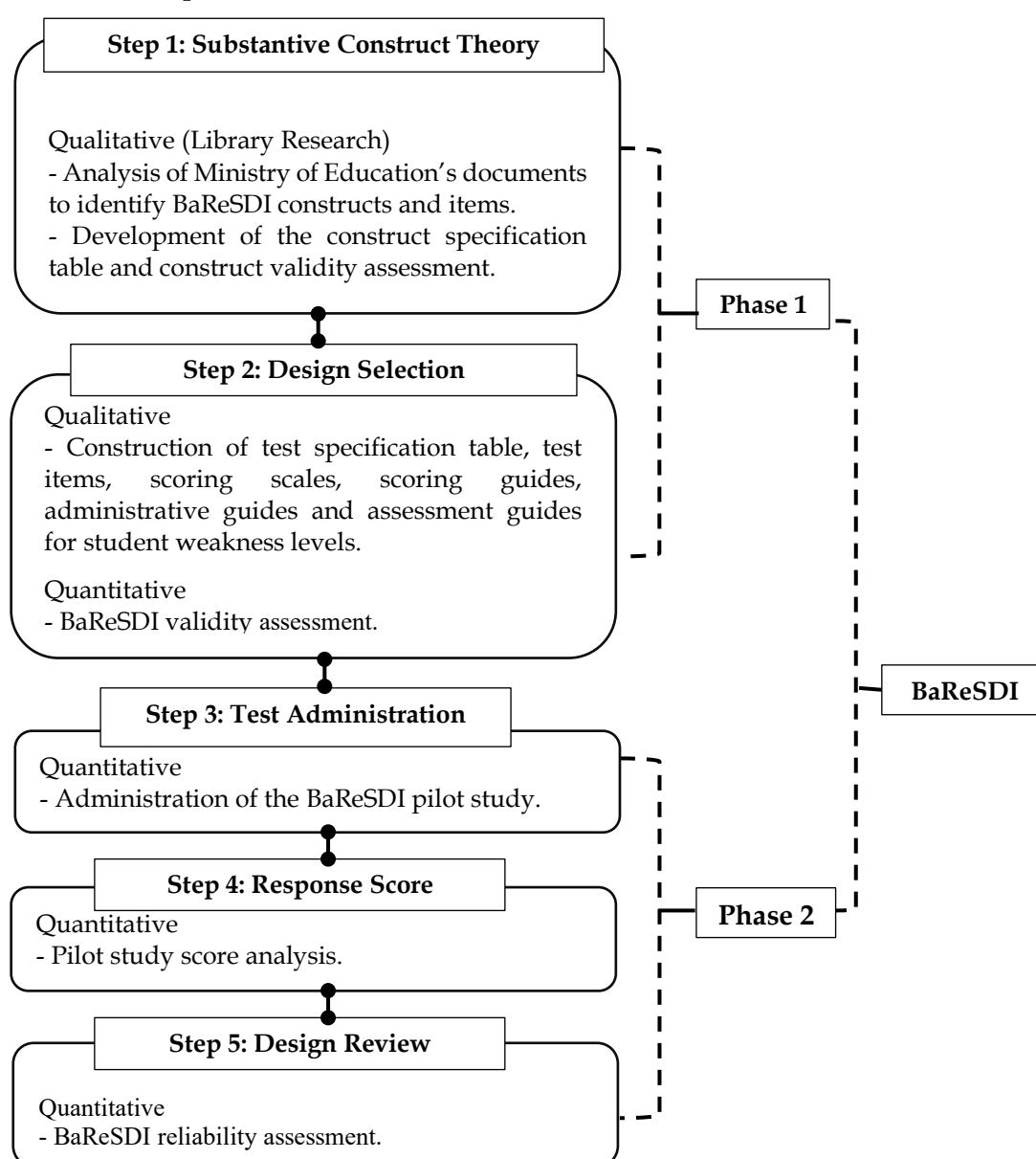


Figure 2: Process and Phases of BaReSDI Development

4.2 Validity of BaReSDI

The validity assessment of BaReSDI was conducted to answer the second research question, namely: What is the validity of BaReSDI? Construct validity assessment, face validity assessment and content validity assessment were conducted to answer the second research question. Face validity assessment was conducted qualitatively while construct validity and content validity assessment were conducted using frequency formulas and percentage of expert agreement based on recommendations (Noah & Ahmad, 2005).

The findings of the construct validity assessment found that all experts agreed with the BaReSDI constructs with a validity index value of 1.00 and an average validity index of 1.00. Table 1 displays the summary of BaReSDI construct evaluation by expert panel.

Table 1: Summary of BaReSDI Construct Evaluation by Expert Panel

Construct	Sub Construct	Expert Evaluation					Validity Index
		E1	E2	E3	E4	E5	
Letter	Lowercase	1	1	1	1	1	1.00
	Uppercase	1	1	1	1	1	1.00
	Vowel	1	1	1	1	1	1.00
Syllable	KV Syllable	1	1	1	1	1	1.00
Word	KV+KV Word	1	1	1	1	1	1.00
	V+KV Word	1	1	1	1	1	1.00
	KV+KV+KV Word	1	1	1	1	1	1.00
Average Validity Index						1.00	

The face validity of BaReSDI was conducted to assess BaReSDI from the aspect of format, language use, clarity of instructions and administration guidelines, font type and suitability of the scoring form. Each expert was provided with BaReSDI and all experts have obtained the face validity assessment questionnaire. Experts were also asked provide opinions and suggestions to improve the BaReSDI. Overall, all experts were satisfied with the BaReSDI, but there were three suggestions.

The following are the suggestions put forward by the experts and the BaReSDI has been revised based on the suggestions.

- i. The font type in the Student Mastery Reporting Form (BPPM) needs to be changed to Century Gothic.
- ii. The font size in the student materials needs to be enlarged to at least size 20.
- iii. The size of the pictures attached to the teacher materials needs to be enlarged.

Table 2 shows the scores of content validity assessments along with the content validity coefficient. Based on Table 2, the content validity coefficient of the BaReSDI is 0.96. Based on the findings, it can be concluded that the BaReSDI has a high level of content validity.

Table 2: BaReSDI Content Validity Assessment Score

Experts	Percentage of Agreement (%)
E1	98
E2	100
E3	97
E4	94
E5	92
Average validity score	96
Content validity coefficient	0.96

4.3 Reliability of BaReSDI

The findings from a pilot study conducted on 30 remedial education students were analyzed to obtain the reliability value of the BaReSDI. The internal consistency assessment method using the Kuder Richardson formula (KR-20) was used to analyze the reliability (Fraenkel et al., 2013). The statistical process was carried out using Microsoft Excel software. The data recorded in the student mastery reporting form was keyed into the software and then analyzed automatically to obtain the reliability value of the BaReSDI based on the KR-20 formula.

Table 3: BaReSDI Reliability Assessment Findings

Item	Number of Participants	Difficulty Index
1	22	0.73
2	22	0.73
3	20	0.66
4	19	0.63
5	25	0.83
6	18	0.60
7	18	0.60
8	17	0.56
9	15	0.50
10	15	0.50
11	14	0.46
12	14	0.46
13	15	0.50
14	14	0.46
15	14	0.46
16	14	0.46
17	15	0.50
18	14	0.46
19	13	0.43

20	14	0.46
21	11	0.36
22	12	0.40
23	11	0.36
24	9	0.30
25	9	0.30
26	8	0.26
27	8	0.26
28	8	0.26
29	8	0.26
30	8	0.26
31	9	0.30
32	10	0.33
KR-20 Value		0.98

Based on Table 3, the KR-20 value obtained from the analysis is 0.98. The value of 0.98 indicates that the BaReSDI has high internal consistency and reliability since it is higher than 0.7 (Carey, 1994 and Bond & Fox, 2025 in Hashim et al., 2022).

5. Discussion

The first research question is: How is BaReSDI developed? To answer this question, a qualitative study using a library research approach was conducted. The findings showed that the Cognitive Diagnostic Model (Nichols, 1994) is the most suitable model to be used as the foundation for developing BaReSDI. This is supported by Saleh (2016), who used the same model to develop a diagnostic test instrument for mechanical writing skills among remedial education pupils.

The second research question is: What is the validity of BaReSDI? To address this question, assessments of content validity, construct validity, and face validity were carried out. The results showed that BaReSDI achieved high validity values and can be duplicated for use in similar contexts. This finding is consistent with Sidek and Jamaludin (2005), who stated that a percentage score higher than 70% or 0.7 indicates a high level of validity.

The third research question is: What is the reliability of BaReSDI? To answer this question, a reliability assessment was conducted. The data showed that BaReSDI has a high reliability value of 0.98, indicating strong internal consistency. This finding is supported by Carey (1994) and Bond and Fox (2015), as cited in Hasnurol et al. (2022).

Based on the overall findings, the development of BaReSDI provides a positive impact on the intervention process for reading skills among remedial education pupils. Remedial education teachers can use this instrument to plan interventions that match the pupils' specific needs and levels. This is supported by Saidin and Bukhari (2023), who emphasised that accurate diagnostic information is crucial

for teachers to design appropriate interventions for remedial education pupils. The findings of this study suggest several important theoretical and practical implications. First, the strong validity and reliability of BaReSDI show its potential to influence remedial education policy by offering policymakers a credible and standardised tool for assessing pupils' reading difficulties. This can encourage the development of policies that prioritise evidence-based identification and resource allocation for intervention programmes.

Second, BaReSDI has the potential to enhance teacher practices by offering precise diagnostic profiles that support more personalised instruction, reflective teaching, and targeted intervention planning in remedial classrooms. Finally, the successful use of the Cognitive Diagnostic Model in developing BaReSDI highlights its relevance for future diagnostic model development. This provides a foundation for further refinement, expansion to other skill areas, and the integration of technology-based diagnostic tools that align with the same theoretical framework.

6. Conclusion

Reading skills play an important role in the academic and career success of each individual. Basic reading skills must be mastered by pupils by the end of their primary school age. However, many pupils face difficulties in mastering basic reading skills, especially the remedial education pupils. Hence, this study has developed a diagnostic instrument named Basic Reading Skills Diagnostic Instrument (BaReSDI) to detect and screen the difficulties areas among remedial education pupils.

This study has positive implications in the education world, especially in the implementation of remedial education program in primary schools. The BaReSDI can be used by remedial education teachers as the diagnostic instrument to detect the strengths and weaknesses of students, thus helpful in their planning for pupils' interventions. This will save teachers' time in preparing their own diagnostic instruments, as the BaReSDI has been validated by five authoritative experts in the field of remedial education program, and its reliability has been proven high.

Therefore, the BaReSDI is a significant diagnostic instrument to provide clear and accurate information about level of mastery and areas of weakness of remedial education pupils. In short, three research questions have been answered. The BaReSDI was developed based on Cognitive Diagnostic Model (Nichols, 1994). The BaReSDI obtained good construct validity, face validity, and content validity. A good reliability value was also achieved for the BaReSDI.

Overall, the implementation of the study can contribute to enhance the reading level and performance among pupils either nationally or internationally. It is an ongoing effort to improve the mastery of basic reading skills among pupils. The involvement of educators in the implementation of scientific research to improve teaching practices is very needed. Therefore, it is recommended that future researchers and educators to conduct more research on the mastery of reading skills among primary school pupils over the countries. The researches can be

implemented in various aspects such as the development of teaching aids, teaching modules, effective teaching practices.

The selection of the Cognitive Diagnostic Model (Nichols, 1994) in the development of the BaReSDI carried out by the researcher is able to help future researchers and teachers in developing more systematic diagnostic instruments, especially for remedial education program. The tests developed also need to go through a validity and reliability assessment process to ensure that the instruments are valid and consistent. This study can also lead to the development of a diagnostic test for comprehension skills other than basic reading skills. In addition, future studies of the diagnostic instruments for writing and mathematics skills can also be conducted based on this Cognitive Diagnostic Model.

The implementation of the study is also hoped to attract the interest of future researchers to explore further regarding the implementation of the remedial education program. This study is important and significant in the framework of empowering education nationwide. This study can also contribute in the effort to provide competitive human capital and be able to master all disciplines well, because the key to mastering all disciplines is mastering basic reading skills.

7. Conflict of Interest

We have no conflicts of interest to disclose.

8. Acknowledgments

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