

Improving Reading Comprehension using Summarization Techniques for Students with Borderline Intellectual Functions

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Abstract-- Students with borderline intellectual functioning (BIF) have below average cognitive abilities but are above the classification for intellectual disability. Generally, these students have low academic skills such as difficulties in comprehending reading material. Using a single-case study design, this study examined the effectiveness of summarization techniques on improving the reading comprehension skills of a student with BIF. More specifically, this study focused on improving the student's comprehension of expository texts by targeting inference comprehension when reading. This study was focused on one 12-year-old male BIF student who has difficulties reading. There were three stages in this study: pre-test, intervention, and post-test; for which the intervention stage employed a direct instruction technique whereby the participant was given texts and trained to summarize each paragraph while reading the passage. The participant was also provided with a visual organizer and a guidance card to support self-regulation while reading. Three measurements were used to assess the success of the intervention; a reading comprehension test, an oral retelling measurement, and a session effectiveness evaluation. The two post-tests were administered one day and one week after the intervention stage. The participant had 23.8% correct answers in the pre-test; however, he achieved 71.4% and 78.6% correct answers in the first and second post-tests and also had oral retelling improvements. During the pre-test, the participant's oral retelling score was 4/30, which increases in the first and second post-test to 18/30 and 23/30. In addition, the participant improved by the end of almost all sessions. Therefore, it was concluded that summarization techniques can be effective in improving student abilities in understanding expository texts. This study presented a strategy that could be employed by practitioners and teachers to improve reading comprehension skills in students with BIF. This study also outlines several factors that should be considered when developing summarization strategy interventions for BIF students.

Keywords: summarization technique, reading comprehension, borderline intellectual functioning

Introduction

Students with borderline intellectual functioning (BIF) have intellectual functions between low average and an intellectual disability (Shaw, 2010); that is, with IQ scores between 70 and 85 (American Psychiatric Association [APA], 2000); and have also been categorized as slow learners, (in the current study, the terms BIF and slow learner are used interchangeably). Surveys have found that between 12 and 18 per cent of the population falls into this category. While a specific survey on slow learning students has not yet been conducted in Indonesia, data from the Ministry of Education indicate that 1 to 30% of Indonesian students have learning problems, which includes those with BIF (Kemendikbud, 1997).

Slow learning is one of the most common educational problems, and dealing with these slow learners is one of the most difficult teaching challenges (Shaw, 2010). Physically, these students have a normal appearance and can function normally in many situations (Cooter &



Cooter Jr., 2004); however, as they are cognitively weaker than their peers in other situations, it is often difficult for teachers and parents to identify their problems early. Therefore, BIF students are usually only identified when they enter elementary school when the academic challenges become more demanding (Cooter & Cooter Jr., 2004).

Having low intellectual functioning causes several learning difficulties (Shaw, 2010; Alloway, 2004; Salvador-Carulla, 2013). For example, BIF students generally need a longer time and greater repetitions than their peers to master a new skill, have low executive functions, working memories and concentration problems, have difficulties understanding abstract concepts, and have low generalization abilities. Therefore, slow learning students generally perform poorly in almost all school subjects and have basic academic skills deficits in areas such as reading. A survey of Indian students found that 25.5% of the sample had reading difficulties (Karande, Kanchan, & Kulkarni, 2008).

Reading is an important skill at school as almost all subjects require students to understand reading materials. At the beginning of elementary school students learn to read and then around 4th grade, they are expected to be able to read to learn (Feeney, 2012); that is, reading becomes the primary method for gaining new knowledge and information. Between the 3rd and 5th grades, students start to build an ability to understand more difficult words (Duke & Carlisle, 2011), with fifth graders being expected to use their prior knowledge when trying to comprehend a text. Students with BIF, however, usually have reading abilities that are one or two years lower than their chronological age (Dietrich, 1965), have a limited vocabulary range, and find it difficult to organize and classify information, draw conclusions and evaluate results (Clubok, 1983). BIF students also find it challenging to understand abstract reading materials (Ediger, 2002).

Walczyk (in Kolic-Vehovec, 2010) defined reading as having two main components; decoding and understanding the linguistic content; that is, comprehending the reading material is the ultimate goal of the reading process. Duke and Carlisle (2011) defined reading comprehension as the action of extracting meaning from a text.

Basaraba, Yovanoff, Alonzo, and Tindal (2013) identified three reading comprehension levels; literal, inferential, and evaluative. Literal comprehension was defined as the ability to understand explicit information such as understanding detailed information, facts, and instructions, inferential comprehension was understanding ideas that are inferred in the text such as information order, comparing and evaluating information, and identifying main ideas, character traits, and cause-effect relationships (Lanier & Davis, 1972), and evaluative comprehension was defined as the highest comprehension level as it requires the reader to analyze and evaluate information based on prior knowledge or information beyond the text.

Reading comprehension is also influenced by text type. In general, there are two types of text; narrative and expository text. Narrative texts, such as stories and novels, are usually read for entertainment, while expository texts give information such as facts, information, procedures, or descriptions. Students are generally exposed to expository texts from late elementary as



reading these are more difficult than narrative texts because there are difficult and unfamiliar words and different structures, and the content is less related to personal experience (Williams, 2005).

Because of the importance of reading comprehension to overall learning, several interventions have been developed to improve reading comprehension skills. Melby-Lervag and Lervag (2014) identified three reading interventions; interventions that directly targeted reading such as programs to improve cognitive and metacognitive skills, interventions that tap into the basic components of reading such as programs that increase decoding and linguistic understanding, and interventions for improving general cognitive abilities such as training to improve working memory. Based on meta-analytical research, the most effective interventions have been found in to be those that target reading comprehension strategies directly such as cognitive strategy interventions (Melby-Lervåg & Lervåg, 2014).

Research shows that cognitive strategy interventions have a positive impact on improving reading comprehension in students both with or without learning disorders (Faggela-Luby & Deshler, 2008; Blume, 2010). One of the cognitive strategies that has proven to be effective in improving reading comprehension in students with low intellectual function has been paragraph summarization techniques (Feeney, 2012), which requires the reader to read the paragraph, understand what the paragraph is about, and then summarize the paragraph using their own words before continuing to the next paragraph. In line with the results from Feeney (2012), Blume (2010) used a strategy similar to summarization, called the RAP technique (Read, Ask, Put), which was found to improve reading comprehension in students with learning difficulties. This technique has also been found to be effective in improving the ability to understand functional reading in students with mild intellectual disabilities (Sukmawan, 2017). For example, Jitendra, Hoppes, and Xin (2000) found that using self-monitoring strategies along with summarization techniques was more effective in improving reading comprehension than the use of the summarization strategies alone. Visual organizers have also been found to be helpful for students with special needs as they can compensate for low working memory while reading (Feeney, 2012).

Significant research has been conducted on the effectiveness of summarization techniques in improving reading comprehension in students with intellectual disabilities or specific learning disabilities. However, few studies have specifically evaluated the effectiveness of this technique in helping slow learners. As mentioned in Salvador-Carulla (2013), there has been little research on BIF students, and previous research on summarization strategies has mostly been focused on functional texts (Feeney, 2012; Faggella-Luby & Deshler, 2008). However, as most slow learners attend general schools, it is important that they learn to understand more complex and challenging expository texts.

Therefore, this study investigated the effectiveness of summarization strategy interventions in improving the reading comprehension abilities of BIF students. More specifically, this study focused on improving the student's comprehension of expository texts by targeting inferential reading comprehension; that is, inferring main ideas, making comparisons, and understanding



cause-effect relationships.

Methods

Participant

The study object was a 12-year old male student in 6th grade at elementary school. As the initial assessment found that the participant's IQ was 71 (based on the Wechsler Intelligence Scale), he was classified as BIF. The participant was reported to be having reading comprehension problems and based on an informal test and interviews with the teachers, the participant's reading ability was surmised to be equivalent a 4th grade level; that is, he was able to understand literal information from a passage but had difficulty in inferring meaning.

Ethics

This research adhered to ethical principles and was approved by the ethics committee of the Faculty of Psychology, Universitas Indonesia. Before the research was conducted, the participant and the participant's parents gave their written consent. The participant was also told that he was allowed to withdraw from the study at any stage without any negative consequences.

Research Design

This research followed a single-case study design. Gravetter and Forzano (2011) defined single-case or single-subject study designs as research that investigates cause-effect relationships in one participant. This research design had several advantages over quantitative research that involves many participants. For example, Byiers, Reichle, and Symons (2012) claimed that single-subject studies allowed researchers to obtain detailed information about the optimum effect of a treatment in a specific individual, which allows the researcher to more deeply understand the dynamics of the intervention procedure, and is ideal for testing a treatment before wider implementation. The current study was a quasi-experimental research that employed a three-stage A-B-A design; baseline (A), treatment (B), and withdrawal of the treatment (A).

Measurements

a. Reading Comprehension Test

To measure the reading comprehension level, three informal reading comprehension tests were developed, which Burton (2008) claimed were most appropriate for single-case study interventions. By accommodating the participant's interests in nature in the treatment, it was expected that he would be more motivated during the intervention. Therefore, the tests consisted of three reading passages about nature, followed by open-ended questions; two 4 paragraph reading passages followed by 6 inferential comprehension questions, and one 5 paragraph passage followed by 9 questions; the scoring guidelines for which were developed and reviewed by an elementary school teacher. Three indicators were used to measure the inferential reading comprehension level; inferring the main idea, comparison, and identifying the cause-effect relationships. Test question examples are shown in Table I.



Table I. Example questions

Indicator	Questions	Scoring Guideline
Inferring main idea	"What is the main idea of the	Score 2: Lake Toba is the largest lake in Sumatera
	first paragraph?"	Score 1: Lake Toba
		Score 0: Indonesia has beautiful nature
Inferring comparison	"Which mountain erupted	Score 2: Mt. Toba eruption, as it lasted for a week
	longer: mount Toba or mount	Score 1: Give answer without explanation
	Krakatau? Please explain!"	Skor 0: Wrong answer
Inferring cause-effect	"What is the effect of cutting	Score 2: River sedimentation
relationship	down trees in the forest	Score 1: Much mud
•	around Lake Toba and	Score 0: Wrong answer
	Samosir Island?"	

b. Oral Retelling

An oral retelling technique was also employed to measure the participant's reading comprehension. After reading each text, the participant was asked to retell the text information in his own words, which was then used to evaluate how well he had generally understood the text and how well he had understood the text structure. This study used oral rather than a written retelling technique to avoid the influence of the participant's writing skills when retelling the information. There were two oral retelling indicators used; information accuracy and text structure identification; with the scoring being based on Culatta (as cited in Burton, 2008), as shown in Table II.

Table II. Scoring for Oral Retelling

Dimension	Score						
	0	1	2	3	4	5	
Accuracy and amount	Includes	little	Includes	some	Includes me	ost important of	
of information	information a	nd mostly	information but may the in		the importa	the important information	
	incorrect or i	rrelevant;	fail to re	tell some	and much	detail. Retells	
	fails to ret	ell most	important ideas. Retell fluently a		fluently and	and elaborately	
	details		information	partially	•	•	
Text Structure	Retell	without	Retell with	out clearly	Retells inf	formation with	
	communication	ng the	showing	the	clear a	and logical	
	original organ	ization of	organization	of	organizatio	n,	
	ideas in the t	ext. Fails	information	in the text	communica	ites topic	
	to clearly s	how the	and how the	e ideas are	sentences	and crucial	
	relationships	between	connected.	Uses	relationship	between	
	ideas & inform	mation	connectors ((and, then)	ideas.	Uses signal	
			but fails t	o express	transitions	appropriately	
			signal	transitions	& links pro	onouns to their	
			correctly		referents co	orrectly	

c. Session Effectiveness Evaluation.

To evaluate the effectiveness of each session, several question sets based on the session objectives were administered before and after the session. These tests were also used to determine whether the participant was able to proceed to the next session or whether the session should be repeated. The success indicators for each session were that the participant was able to achieve 60% correct answers and he was able to provide the answers without excessive prompting. Both these indicators had to be met before the participant was able to move on to



the subsequent session. Walker (in Margolis & McCabe, 2006) claimed that students could be considered to have good reading comprehension if they achieved 60% correct answers in the reading comprehension measurement.

Procedure

The program employed a direct instruction strategy that was designed based on the 8-step intervention procedures in Ellis, Deshler, Lenz, Schumaker, & Clark (1991): (1) pre-test and commitment, (2) strategy description, (3) modeling, (4) verbal practice, (5) controlled practiced and feedback, (6) advanced practice and feedback, (7) post-test and generalization commitment, and (8) generalization. To simplify the procedure, the program was divided into three stages; a pre-program or baseline stage, an intervention stage, and a post-program or evaluation stage. All stages were conducted in a quiet, bright environment that was conducive to learning.

1. Pre-program

The pre-program stage, which was conducted in one day, involved reading comprehension tests to collect the baseline participant data. The participant was given three passages followed by inferential comprehension questions. He read each passage out loud, then was asked to retell as much as information as he could remember from the text in his own words, after which he was given the questions. After he finished the first passage, he was then given the second passage and then the last passage.

2. Intervention

The intervention stage was divided into three phases. The first phase was strategy description, modelling, and verbal practice. This phase was designed to be run in one meeting. The second phase was the controlled practice and feedback. During the second phase, the researcher modelled and guided the participant in applying the summarization strategy, then the supports were gradually removed. The second session consisted of three sessions that was designed based on the criterions of inferential level of reading comprehension used in this study: inferring main idea, comparison, and cause-effect relationship. The last phase was the advanced practice phase which consisted of two meetings. The intervention program was designed to be completed in 6 to 12 meetings depended on the participant performance in each session. The detailed procedure of the intervention was displayed in the Table III.

3. Post-Program

There were two post-test sessions for the post-program or evaluation stage. Two post-tests were administered to evaluate if the participant was able to maintain the new skills over time. The first post-test was conducted one day after the last intervention session and the second was conducted one week after the first post-test. The post-test reading comprehension tests followed the same procedure as the pre-program baseline tests.



Table III. Intervention

Phase 1: Strategy description, modeling, and verbal practice			
Session Objectives	Procedure		
Session 1: Describe	Pre-session test: Arrange and explain the steps for the summarization technique in the		
and model the	correct order (Max. Score: 20)		
summarization	Intervention:		
strategy, provide	1. Explain the summarization strategy and how to use the guideline card and the visual		
verbal practice	organizer.		
	2. Model the summarization strategy.		
	3. Ask the participant to memorize and verbally practice the strategy.		
	Post-session test: Arrange and explain the summarization technique steps in the correct		
	order (Max. Score: 20)		
	Phase 2: Controlled practice and feedback		
Session Objectives	Procedure		
Session 2:	Review Session 1		
Understand and infer	Pre-session test: Write down the main idea for each paragraph from a passage (Max.		
the main idea of a	Score: 16)		
paragraph	Intervention:		
	Model the summarization technique for a one-paragraph text		
	Guide the participant to apply the summarization technique for a one-paragraph text.		
	Direct feedback was given each time the participant provided the main information in		
	each sentence.		
	Ask participant to apply the summarization technique to a one-paragraph text. Direct		
	feedback was given after the participant provided the main idea in the paragraph.		
	Ask participant to apply the summarization technique in a text that consists of two to three		
	paragraphs. Direct feedback was given after the participant provided the main idea in each		
	paragraph.		
	Post-session test: Write down the main idea in each paragraph from a passage (Max.		
	Score: 16)		
Session 3:	Review Session 1-2		
Understand and infer	Pre-session test: Read a text and answer 5 questions about comparison (Max. Score: 20)		
comparison in a text	Intervention:		
	Model the summarization technique for a one-paragraph text		
	Guide the participant to apply the summarization technique in a one-paragraph text.		
	Direct feedback was given every time the participant provided the main information in		
	each sentence.		
	Ask the participant to apply the summarization technique in a one-paragraph text. Direct		
	feedback was given after the participant provided the main idea in the paragraph.		
	Ask the participant to apply the summarization technique in a text that consisted of three		
	to four paragraphs. Direct feedback was given after the participant provided the main idea		
	in each paragraph. Give 5 comparison questions based on the text.		
	Post-session test: Read a text and answer 5 comparison questions. (Max. Score: 20)		
Session 4:	Review Session 1-3		
Understand and infer	Pre-session test: Read a text and answer 5 cause-effect questions. (Max. Score: 20)		
cause-effect	Intervention:		
relationships in a text	Model the summarization technique for a one-paragraph text		
	Guide the participant to apply the summarization technique to a one-paragraph text.		
	Direct feedback was given every time the participant provided the main information in		
	each sentence.		
	Ask the participant to apply the summarization technique to a one-paragraph text. Direct		
	feedback was given after the participant provided the main information in the paragraph.		



	Ask the participant to apply the summarization technique to a text that had three to four paragraphs. Direct feedback was given after the participant provided the main information in each paragraph. Give 5 cause-effect questions based on the text.				
Post-session test: Read a text and answer 5 cause-effect questions. (Max. Score: 20)					
Phase 3: Advanced practice and feedback					
Session Objectives	Procedure				
Session 5: Familiarize	Review Sessions 1-4				
the subject with the	Pre-session test: Read a text and answer 6 inferential questions (Maximum Score: 24)				
summarization	Intervention:				
technique	1. Give the participant a four-paragraph text				
	2. Ask participant to apply the summarization technique independently.				
	3. Provide feedback for the paragraph summaries. Give 6 inferential questions.				
	Post-session test: Read a text and answer 6 inferential questions. (Maximum Score: 24)				
Session 6: Familiarize	Review Sessions 1-5				
the subject with the	Pre-session test: Read a text and answer 9 inferential questions. (Maximum Score: 36)				
summarization	Intervention:				
technique	1. Give the participant a four-paragraph text.				
	2. Ask the participant to apply the summarization technique independently.				
	3. Provide feedback for the paragraph summaries. Give 9 inferential questions.				
	Post-session test: Read a text and answer 9 inferential questions. (Maximum Score: 36)				

Results

The complete program involved 14 classes over 3 weeks. The pre-program stage was conducted in one class, the intervention stage was conducted over 10 classes, and the post-program stage was conducted over two classes, one each for the first and second post-tests. Some class repetitions were necessary in the intervention stage as the participant did not meet the success criteria. The detailed intervention information is given in Table IV.

a. Session Effectiveness Evaluation

The session evaluations involved pre- and post-session test score comparisons. After the first session, as the participant achieved 90%, which was a significant increase, he was able to proceed to the second phase of the intervention program. All sessions in the second phase were repeated at least once; however, the second intervention session was held over two classes. At the end of the first session 2 class, even though the participant achieved 62.5% correct answers, as he had needed a lot of promoting to complete the answers, the session was repeated after which he was able to achieve 81.25% correct answers. The third session was also conducted over two classes for the same reason, at the end of which he achieved 85% correct answers with little assistance. The fourth session was also repeated twice because of inconsistent performances. The participant admitted that as he found it difficult to understand the cause and effect relationships, he had guessed the answers in the pre- and post-session tests; however, after the second class, he was able to achieve 90% correct answers without assistance. The fifth and sixth sessions were each completed in one class as the participant was able to produce 83.3% and 91.67% correct answers at the end of session 5 and session 6. On average, the participant received a score of 44.34% in the pre-session tests, which increased by over 30% on average by the end the sessions to 78.31%.

Except for the first class in session 4, the participant was able to achieve a higher score at the



end of almost all sessions than at the beginning. The statistical analysis using Wilcoxon Signed Rank Test found that these score differences were significant (Z = -2.703, p = 0.007). The visual comparison for the pre-session and post-session scores is shown in Figure 1.

Table IV. Intervention program

Session	Number of Classes			
Phase 1: Strategy description, modeling, and verbal practice				
Session 1: Describe and model summarization strategy, provide verbal	1			
practice				
Phase 2: Controlled practice and feedback				
Session 2: Understand and infer the main idea of paragraph	2			
Session 3: Understand and infer comparisons in a text	2			
Session 4: Understand and infer cause-effect relationships in a text	3			
Phase 3: Advanced practice and feedback				
Session 5: Familiarize the subject with the summarization technique	1			
Session 6: Familiarize the subject with the summarization technique	1			

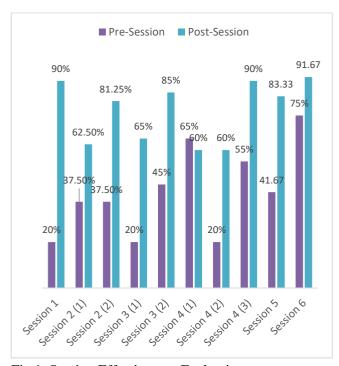


Fig.1. Session Effectiveness Evaluation

b. Reading Comprehension Test

During the pre-program stage, the participant achieved only 23.8% correct answers. However, there was a marked improvement in both the first and second post-tests, with the overall score for post-test 1 being 71.4% and the overall score for post-test 2 being 78.6%. Figure 2 shows the details of these score improvements.



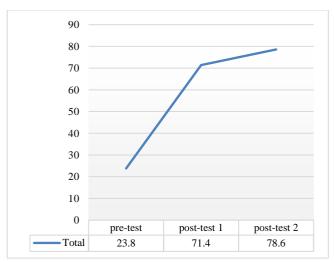


Fig. 2. Results of Reading Comprehension Tests

c. Oral Retelling

The participant received a total score of 4/30 in the oral retelling pre-test. However, after the intervention, there was a significant improvement to 18/30 for post-test 1 and 23/30 for post-test 2 with greater improvements being observed for structure than information accuracy. Figure 3 illustrates the score improvements.

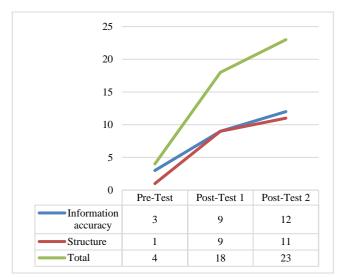


Fig. 3. Results of Oral Retelling Measurement

Discussion and Conclusion

As described, there was a significant improvement in the participant's reading comprehension tests and oral retelling after the intervention, which was in line with the results from previous studies that found that the summarization technique was effective in improving the reading comprehension skills of students with low cognitive abilities (e.g., Feeney, 2012; Ediger, 2002).

Kintsch and Van Dijk (1978) explained that readers go through several mental operations when processing and building an understanding of reading material such as deleting unnecessary



information and generalizing and inferring global meaning. As these types of mental operations were directly trained as part of the summarization technique intervention, in line with the explanation in Duke and Pearson (2002), the summarization intervention not only improved the participant's understanding of the technique but also increased his general reading comprehension.

Previous studies have found that summarization technique training has increased the reader's memory of what they had read (Zafarani & Kabgani, 2014). Therefore, this strategy could be helpful for BIF students who tend to have a low working memory as it involves memorizing the content from each paragraph. As was shown in this study, the participant's text memory accuracy, the amount of information he was able to give in the oral retelling measurement and his ability to logically structure the information in the retelling all improved, which was in agreement with the conclusions in Zafarani and Kabgani (2014) that summarization increases a reader's awareness of information organization.

As explained, all sessions in the controlled practice phase were repeated, which was because slow learning students require more practice and more time than typically developing students when acquiring a new skill (Shaw, 2010; Cooter & Cooter Jr., 2004).

The current study revealed several factors that should be considered when developing reading comprehension intervention programs for BIF students. First, it is necessary to ensure that there is a conducive environment as quiet, private rooms reduce distractions and increase participant concentration (Cooter & Cooter Jr., 2004). Second, the timing of the intervention also influenced the participant's performance as it affected his physical and cognitive condition; for example, the participant had lower performances when the sessions were conducted in the afternoon or after school. Sievertsen, Gino, and Piovesan (2016) found that students tended to have lower test performances when tests were conducted later in the day. Third, the participant's motivation was affected by the reading material topics used in the intervention program. Guthrie, Hoa, Wigfield, Tonks, and Perencevich (2005) suggested that student curiosity about and interest in reading material topics was related to their intrinsic reading motivation.

Another finding was the ability of the participant to retain the summarization skills. The results from the second post-test showed that the new skills were solidified over the week, which led to an increased score in the second post-test, which indicated that BIF students are able to learn and retain knowledge if they are given instructions that suit their characteristics (Cooter & Cooter Jr., 2004).

Although the current research has provided positive findings, there were several limitations. First, as only the inferential level of reading comprehension was examined, it is still not clear whether BIF students have the ability to improve their evaluative comprehension using summarization techniques. Therefore, future research could investigate this question to gain a more comprehensive understanding of the effectiveness of reading comprehension strategies for slow learning students. As this study was a single-case study, the results cannot be



generalized to all BIF students. Therefore, to ensure optimum results from an intervention program, the participant characteristics should be accounted for when replicating or modifying the program used in the study. Further research could also replicate the program using a larger sample so that the results could be generalized.

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