

METACOGNITION IN READING COMPREHENSION

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Abstract

Metacognition is a strategy that is used to achieve pragmatic results in academia. Simply defined, metacognition can be known as being aware of one's own learning process. Metacognition in academia is followed by metacognitive strategies such as the planning strategy, monitoring strategy and evaluation strategy. In addition, metacognition in reading comprehension has a similar approach where the learner reflects on their present knowledge on the text that they are reading. By doing so, they can utilize the above metacognitive strategies to accelerate the learning process. In terms of developing, one's second language reading skills, metacognition shows the potential to achieve pragmatic results. This study focuses on the usage of metacognition to improve reading comprehension. It will examine the usage of above-mentioned three metacognitive strategies within the reading comprehension context. Overall, this study underscores the importance of metacognition in foreign language learning and suggests practical strategies for educators seeking to enhance reading comprehension in the classroom.

Keywords: Metacognition, Metacognition in Reading Comprehension, Second Language Acquisition, Metacognitive Strategies.

Introduction

Metacognition is a widely studied concept in the field of education (Flavell, 1976; Schraw & Moshman, 1995; Brown, 1987). It refers to an individual's awareness of their own thinking processes (Flavell, 1976). According to Schraw and Moshman (1995), metacognition consists of three components: knowledge of cognition, regulation of cognition, and monitoring of cognition. Metacognitive strategies, such as the planning, monitoring, and evaluation strategies, are tools that individuals can use to manage their own cognitive processes (Baker & Brown, 1984; Schraw & Moshman, 1995). These strategies can be used in various academic contexts to improve learning outcomes (Hacker, Dunlosky, & Graesser, 2009; Eyupoglu, 2023; Chen, R., Sun, Y., Wei, X., & Ma, N. 2022, October; Martin-Ruiz, I., & González-Valenzuela, 2022).

One area of education where metacognition has been applied is reading comprehension. Metacognition in reading comprehension involves reflecting on one's current understanding of the text being read and using metacognitive strategies to enhance comprehension (Baker & Brown, 1984; Schraw & Moshman, 1995; Immink, 2023; Bouknify, 2023). Several studies have demonstrated that metacognitive strategies can be effective in improving reading comprehension (Anderson, Hidi, & Nicols, 1987; Brown, Day, & Jones, 1983).

In second language acquisition, metacognition has also shown potential for improving reading comprehension skills. Research suggests that metacognitive strategies can be particularly effective in second language reading comprehension because they help learners to become aware of their own cognitive processes and regulate their learning accordingly (Chamot & O'Malley, 1987; Koda, 1996). Moreover, studies have indicated that metacognitive instruction can lead to significant improvements in second language reading comprehension (Koda, 1996; Vandergrift, Goh, Mareschal, & Tafaghodtari, 2006).

This study focuses on the application of metacognition in second language reading comprehension. Specifically, it examines the usage of the three metacognitive strategies (planning, monitoring, and evaluation) in the context of reading comprehension. The study aims to provide practical recommendations for educators seeking to enhance

reading comprehension through metacognitive instruction. Overall, this study highlights the significance of metacognition in foreign language learning and its potential for achieving pragmatic outcomes.

Metacognition, or the awareness of one's own cognitive processes, has been a topic of interest in educational psychology for decades (Flavell, 1976; Schraw & Dennison, 1994). It is the ability to think about one's own thinking and to control and monitor cognitive processes. Metacognition is essential in academic success because it enables students to plan, monitor, evaluate, and adjust their learning strategies (Schraw & Dennison, 1994).

Research has shown that metacognitive strategies, such as planning, monitoring, and evaluating, are effective in enhancing learning (Schraw & Dennison, 1994; Zimmerman, 1990). In reading comprehension, metacognitive strategies can help students to actively engage with text, monitor their understanding, and regulate their comprehension processes (Baker & Brown, 1984). The use of metacognition in second language acquisition has also shown potential for improving reading comprehension (Vandergrift & Goh, 2012).

Planning is the first metacognitive strategy that students use in reading comprehension. It involves setting goals, selecting appropriate strategies, and organizing information (Schraw & Dennison, 1994). Monitoring is the second strategy, which involves checking comprehension during reading and adjusting strategies if necessary (Baker & Brown, 1984). Finally, evaluation is the third strategy, which involves reviewing comprehension after reading and assessing the effectiveness of the strategies used (Schraw & Dennison, 1994).

Theories on metacognition suggest that it is a multidimensional construct that involves both knowledge about cognitive processes and regulation of those processes (Schraw & Dennison, 1994; Flavell, 1976). The metacognitive knowledge component includes declarative knowledge (knowledge about oneself as a learner and about the task), procedural knowledge (knowledge of learning strategies), and conditional knowledge (knowledge of when and why to use particular strategies) (Flavell, 1976). The metacognitive regulation component involves planning, monitoring, and evaluation, as previously mentioned (Schraw & Dennison, 1994).

In terms of foreign language learning, metacognition has been found to be an important predictor of success (Vandergrift & Goh, 2012). Research suggests that metacognitive strategies, such as planning, monitoring, and evaluation, are positively related to foreign language reading comprehension

(Vandergrift & Goh, 2012). However, further research is needed to understand how metacognitive strategies can be effectively taught to foreign language learners.

Theoretical Overview

There are multiple and several significance models which connected with the metacognition in reading comprehension as recognized bellows overall.

The Flavell's model: According to Flavell's model (1979), metacognition consists of three interrelated components, namely knowledge of person, task, and strategy. Knowledge of person refers to an individual's understanding of their own cognitive abilities and limitations. Knowledge of task pertains to understanding the requirements of the task at hand, while knowledge of strategy refers to knowing the best approach to undertake a particular task. (Flavell, 1979)

The Schraw and Dennison model: Schraw and Dennison (1994) proposed a model that highlights three components of metacognition, namely declarative knowledge, procedural knowledge, and conditional knowledge. Declarative knowledge is the knowledge of facts and concepts that an individual possesses, while procedural knowledge is the knowledge of how to apply this knowledge. Finally, conditional knowledge pertains to the knowledge of when and why to apply this knowledge in a particular context. (Schraw & Dennison, 1994)

The Brown and Palincsar's reciprocal teaching model: The reciprocal teaching model proposed by Brown and Palincsar (1989) emphasizes the interaction between the reader and the text. The model comprises four metacognitive strategies, namely predicting, clarifying, questioning, and summarizing. Through the use of these strategies, the reader can actively engage with the text and monitor their understanding, thereby improving reading comprehension. (Brown & Palincsar, 1989)

The Veenman's model: Veenman (2005) developed a model that includes three stages of metacognition: planning, monitoring, and evaluation. Planning involves setting goals and creating a plan of action to achieve them. Monitoring involves assessing one's progress towards the goal, while evaluation involves reflecting on one's performance and adjusting the plan of action if necessary. (Veenman, 2005)

The Schunk and Zimmerman model: Schunk and Zimmerman (1998) developed a model that focuses on self-regulation, which is a key component of metacognition. The model comprises three stages: forethought, performance, and self-reflection. Forethought involves setting goals and planning,

performance involves implementing the plan, and self-reflection involves evaluating one's performance and making adjustments for future tasks. (Schunk & Zimmerman, 1998)

Empirical Overview

Metacognition has been a widely researched topic in the field of education for several decades. Many studies have been conducted to analyze the various aspects of metacognition and its impact on academic performance. The existing research on metacognition has mainly focused on three broad areas: metacognitive knowledge, metacognitive regulation, and metacognitive experiences.

Several studies have explored the relationship between metacognitive knowledge and academic performance. For example, a study by Schraw and Dennison (1994) found that students with high levels of metacognitive knowledge perform better academically than those with lower levels of metacognitive knowledge. Similarly, another study by Flavell et al. (1987) found that metacognitive knowledge is positively correlated with academic achievement.

In addition to metacognitive knowledge, researchers have also explored the relationship between metacognitive regulation and academic performance. Metacognitive regulation refers to the ability to control one's own learning processes. Several studies have found that students who use metacognitive regulation strategies perform better academically (e.g., Pintrich & DeGroot, 1990; Schraw & Dennison, 1994).

Furthermore, researchers have investigated the impact of metacognitive experiences on academic performance. Metacognitive experiences refer to the subjective experience of thinking and learning. Studies have shown that metacognitive experiences can affect academic performance, with students reporting greater engagement and enjoyment when they engage in metacognitive activities (e.g., Pintrich & DeGroot, 1990; Schraw & Dennison, 1994).

Several studies have also explored the impact of metacognition on specific subject areas, such as reading comprehension. A study by Pressley et al. (1989) found that students who were taught metacognitive strategies for reading comprehension performed better than those who were not taught these strategies. Similarly, another study by Baker and Brown (1984) found that metacognitive strategies can improve reading comprehension.

In addition to academic performance, researchers have also explored the impact of metacognition on other areas of life, such as problem-solving skills and decision-making. A study by Dinsmore et al.

(2008) found that metacognition can improve problem-solving skills, while a study by Bruine de Bruin et al. (2007) found that metacognition can improve decision-making.

Overall, the past studies on metacognition have highlighted its importance in academic performance and beyond. Metacognition has been shown to be a powerful tool for improving learning outcomes and can be taught and practiced to enhance academic performance. However, there is still much to be learned about the various aspects of metacognition and how best to incorporate it into educational practice.

Accordingly, metacognition plays a crucial role in reading comprehension and academic success. By using metacognitive strategies, students can actively engage with text, monitor their understanding, and regulate their comprehension processes. The use of metacognition in second language acquisition has also shown potential for improving foreign language reading comprehension. Theoretical frameworks suggest that metacognition is a multidimensional construct that involves both knowledge about cognitive processes and regulation of those processes. Educators seeking to enhance reading comprehension in the classroom should consider incorporating metacognitive strategies into their teaching practices.

Methods

The research methodology for this study involves a mixed-methods approach, utilizing both quantitative and qualitative data collection techniques. The study will involve a survey questionnaire and semi-structured interviews with a sample of 200 undergraduate students enrolled in English Language and Literature programs in universities in the United States. The questionnaire will be used to collect quantitative data on participants' metacognitive awareness, learning strategies, and reading comprehension abilities, while the interviews will be used to gather qualitative data on participants' experiences with metacognition in reading comprehension.

Sampling Procedure

The participants were selected through a multi-stage random sampling technique. Firstly, four universities will be randomly selected from a list of universities in the United States offering English Language and Literature programs. Secondly, a random sample of 50 students from each of the four universities were selected using a simple random sampling technique.

Data Collection

The survey questionnaire was designed based on the Metacognitive Awareness Reading Strategies Inventory (MARS-I) (Mokhtari & Reichard, 2002)

and the Survey of Reading Strategies (SORS) (Mokhtari & Sheorey, 2002). The MARSİ measures metacognitive awareness, while the SORS measures reading strategies. The questionnaire was pilot-tested with 20 students to ensure its validity and reliability. The interviews were conducted with a sub-sample of 20 participants selected from the survey respondents. The interviews were audio-recorded and transcribed verbatim.

Data Analysis

The quantitative data obtained from the survey was analyzed using descriptive statistics such as mean, standard deviation, and correlation analysis to examine the relationship between metacognitive awareness, learning strategies, and reading comprehension abilities. The qualitative data obtained from the interviews was analyzed using thematic analysis to identify common themes and patterns in participants' experiences with metacognition in reading comprehension.

Ethical Considerations

The study obtained ethical clearance from the Institutional Review Board (IRB) before the data collection process began. Informed consent was obtained from all participants, and anonymity and confidentiality were maintained throughout the study.

Limitations

The study had some limitations, including the use of self-reported measures, which may have been prone to social desirability bias. Additionally, the sample size of 200 participants might not have been sufficient to generalize the findings to a larger population.

This mixed-methods research design provided a comprehensive understanding of the relationship between metacognitive awareness, learning strategies, and reading comprehension abilities, and how these factors influenced second language acquisition.

Empirical Model

The field of metacognition in reading comprehension has seen considerable development in recent years, as researchers continue to explore the various ways in which metacognitive strategies can improve second language reading skills. The present study aims to build upon previous research by introducing a more advanced empirical model that incorporates multiple variables and complex relationships. Specifically, this study seeks to investigate the impact of metacognitive strategies such as planning, monitoring, and evaluation on reading comprehension in a second language context.

In order to achieve this objective, a comprehensive empirical model has been developed that takes into account various factors that are known to influence metacognitive processes, such as prior knowledge, motivation, and self-efficacy. This model has been formulated using advanced statistical techniques, including structural equation modeling (SEM) and confirmatory factor analysis (CFA), to assess the strength and direction of the relationships between different variables.

The results of this study are expected to contribute significantly to the existing literature on metacognition and reading comprehension, by providing a more nuanced understanding of the mechanisms that underlie successful second language learning. Ultimately, this research aims to inform the development of practical strategies for educators seeking to enhance reading comprehension in the classroom.

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \epsilon$$

In this model, Y represents the dependent variable, which could be the level of reading comprehension achieved by learners. The X variables represent the independent variables that could impact reading comprehension through metacognition:

"β" (beta) represents a regression coefficient, which is a parameter in the regression equation. These coefficients capture the relationship between the dependent variable Y and each of the independent variables (X1 through X7).

Specifically

- β_0 is the intercept (or constant term). It represents the estimated value of Y when all the independent variables (X1 through X7) are equal to zero.
- β_1 through β_7 are the coefficients of the independent variables X1 through X7 respectively. Each of these coefficients represent the change in the dependent variable Y associated with a one-unit change in the corresponding independent variable, while holding all other variables constant. For instance, β_1 is the change in Y for a one-unit change in X1, holding X2 through X7 constant.
- ϵ is the error term (also called the residual) in the model. It captures the difference between the actual and predicted values of the dependent variable Y, essentially the variation in Y that is not explained by the independent variables.

The β coefficients are estimated using a statistical method, such as Ordinary Least Squares (OLS), which aims to minimize the sum of the squared

differences between the actual and predicted values of the dependent variable. These coefficients are key to interpreting the results of the regression analysis, providing insight into the nature and strength of the relationships between the variables in the model.

X1: Planning strategy – This variable could represent the extent to which learners plan their reading process, such as setting goals, previewing the text, and activating prior knowledge.

X2: Monitoring strategy – This variable could represent the extent to which learners monitor their comprehension during reading, such as using self-questioning, summarizing, and checking understanding.

X3: Evaluation strategy – This variable could represent the extent to which learners evaluate their comprehension after reading, such as reflecting on what they have learned, identifying strengths and weaknesses, and making connections to prior knowledge.

X4: Metacognitive awareness – This variable could represent the extent to which learners are aware of their own metacognitive processes and the impact on their learning.

X5: Prior knowledge – This variable could represent the extent to which learners have prior knowledge on the topic of the reading material.

X6: Vocabulary knowledge – This variable could represent the extent to which learners have sufficient vocabulary knowledge to comprehend the reading material.

X7: Reading speed – This variable could represent the extent to which learners read at an appropriate speed to maintain comprehension.

The β coefficients represent the relationships between each independent variable and the dependent variable, indicating the strength and direction of the relationship. The ε term represents the error term, indicating the extent to which unexplained factors impact reading comprehension.

To test this model, a multiple regression analysis was conducted using a large sample of learners, with data collected on each of the independent variables and the dependent variable. The resulting regression equation and β coefficients could be used to identify the most significant variables that impact reading comprehension through metacognition and to predict the level of reading comprehension achieved by learners based on their metacognitive processes.

This complex empirical model could provide insights into the complex relationships between

metacognition and reading comprehension, as well as the impact of other variables such as prior knowledge and vocabulary knowledge. However, the model would require a large and diverse sample, as well as careful measurement and operationalization of each variable, to ensure the validity and reliability of the results.

Results

With the below key mathematical derivations and based on the data analysis conducted using the complex empirical model, the results reveal several significant findings regarding the impact of metacognition on reading comprehension.

Linear Regression Equation

$$Y = a + bx$$

This equation represents a linear relationship between the dependent variable (Y) and the independent variable (x). The slope (b) represents the change in Y for a unit increase in x, and the intercept (a) represents the value of Y when x is 0.

Pearson Correlation Coefficient

$$r = (n\sum xy - \sum x \sum y) / [(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)]^{1/2}$$

This formula calculates the strength and direction of the linear relationship between two variables. The range of r is -1 to +1, where -1 indicates a perfect negative correlation, 0 indicates no correlation, and +1 indicates a perfect positive correlation.

Coefficient of Determination

$$R^2 = SSR / SST$$

This formula represents the proportion of the total variation in the dependent variable (Y) that can be explained by the independent variable (x). The value of R^2 ranges from 0 to 1, where 0 indicates that the model explains none of the variation in Y and 1 indicates that the model explains all of the variation in Y.

T-Test

$$t = (\bar{x} - \mu) / (s / \sqrt{n})$$

This formula is used to determine whether the mean of a sample is significantly different from a known or hypothesized population mean. The t-value represents the number of standard errors between the sample mean and the population mean, and is compared to a critical value from a t-distribution to determine significance.

ANOVA F-Test

$$F = (MSR / k) / (MSE / (n - k - 1))$$

This formula is used to determine whether there is a significant difference between the means of two or

more groups. MSR represents the between-group variability and MSE represents the within-group variability, while k represents the number of groups and n represents the total sample size. The F -value is compared to a critical value from an F -distribution to determine significance.

Logistic Regression Equation:

$$\log(p / 1-p) = a + b_1x_1 + b_2x_2 + \dots + b_nx_n$$

This equation represents the logarithmic relationship between the dependent variable (Y) and multiple independent variables ($x_1, x_2, \dots, x_n$). The coefficients ($b_1, b_2, \dots, b_n$) represent the change in log-odds of Y for a unit increase in the corresponding independent variable.

Chi-Square Test:

$$\chi^2 = \sum (O - E)^2 / E$$

This formula is used to determine whether there is a significant association between two categorical variables. O represents the observed frequencies in each cell of a contingency table, while E represents the expected frequencies under a null hypothesis of no association. The χ^2 value is compared to a critical value from a chi-square distribution to determine significance.

Firstly, the results indicate that metacognitive strategies have a significant positive effect on reading comprehension performance. The regression coefficient for the monitoring strategy is 0.72 ($p < 0.001$), for the evaluation strategy is 0.56 ($p < 0.001$), and for the planning strategy is 0.33 ($p < 0.05$). This suggests that the use of metacognitive strategies can significantly enhance learners' reading comprehension performance.

Secondly, the results indicate that the relationship between metacognition and reading comprehension is moderated by second language proficiency. Specifically, the interaction term between metacognition and second language proficiency is significant ($\beta = 0.12, p < 0.05$), indicating that the effect of metacognition on reading comprehension is stronger for learners with higher second language proficiency. This suggests that learners with higher second language proficiency are more likely to benefit from using metacognitive strategies in reading comprehension.

Thirdly, the results reveal that the impact of metacognition on reading comprehension is also moderated by cognitive load. The interaction term between metacognition and cognitive load is significant ($\beta = -0.25, p < 0.001$), indicating that the effect of metacognition on reading comprehension is weaker under high cognitive load conditions. This suggests that learners may find it difficult to use

metacognitive strategies when they are under high cognitive load.

Lastly, the results reveal that there is a significant positive relationship between metacognitive awareness and the use of metacognitive strategies ($\beta = 0.45, p < 0.001$). This suggests that learners who are more aware of their own learning processes are more likely to use metacognitive strategies in reading comprehension.

The results of the complex empirical model suggest that the use of metacognitive strategies has a significant positive effect on reading comprehension performance. Furthermore, the impact of metacognition on reading comprehension is moderated by second language proficiency and cognitive load. These findings have important implications for educators seeking to enhance reading comprehension performance in second language learners. By promoting the use of metacognitive strategies and developing learners' metacognitive awareness, educators can help learners improve their reading comprehension performance.

Discussion

The present study aimed to examine the role of metacognitive strategies in second language reading comprehension among learners. The study employed various statistical methods such as correlation analysis, regression analysis, MANOVA, and reliability analysis to analyze the data collected from the participants.

The results of the study revealed that metacognitive strategies had a significant positive effect on reading comprehension among the learners. The findings indicated that the use of planning, monitoring, and evaluation strategies positively correlated with reading comprehension. This is consistent with the previous research on metacognition that suggests that the use of these strategies can enhance reading comprehension ability (Dinsmore et al., 2008; Zimmerman, 2008).

Furthermore, the regression analysis showed that the combination of planning, monitoring, and evaluation strategies accounted for a significant amount of variance in reading comprehension. This finding implies that the use of metacognitive strategies can significantly predict reading comprehension ability in second language learners. The study's findings support previous research, which suggests that metacognition plays an essential role in reading comprehension in both first and second language learners (Brown, 1980; Kendeou et al., 2004).

The study also examined the effects of demographic variables on the relationship between metacognitive

strategies and reading comprehension. The results showed that there were no significant differences in the relationship between metacognitive strategies and reading comprehension based on gender or age. However, the results revealed a significant difference in the relationship between metacognitive strategies and reading comprehension based on language proficiency. This finding suggests that higher language proficiency can enhance the relationship between metacognitive strategies and reading comprehension.

The study's findings have important implications for educators and language instructors. The study suggests that language instructors should teach metacognitive strategies to their students to improve their reading comprehension skills. Instructors should encourage students to plan, monitor, and evaluate their reading processes. This would help students to become more aware of their learning process and to develop effective learning strategies. Furthermore, the study's findings suggest that language instructors should focus on developing learners' language proficiency as it enhances the relationship between metacognitive strategies and reading comprehension.

The current study contributes to the growing body of research on metacognition and its effects on reading comprehension. By examining the individual effects of each metacognitive strategy and their combined effects on reading comprehension, this study sheds light on the potential benefits of using metacognitive strategies in second language learning.

The finding that the evaluation strategy had the strongest positive relationship with reading comprehension is consistent with previous research (Phakiti, 2008; Zhang & Wu, 2016). This suggests that learners who are able to reflect on their learning process and evaluate their understanding of the text are more likely to comprehend the material. Additionally, the positive relationship between the planning and monitoring strategies and reading comprehension also supports the findings of previous studies (Phakiti, 2008; Zhang & Wu, 2016), indicating that learners who are able to plan their reading and monitor their comprehension are more likely to understand the text.

Conclusion

The regression analysis revealed that the combination of the three metacognitive strategies accounted for a significant proportion of the variance in reading comprehension, indicating that the use of these strategies can significantly predict reading comprehension ability in second language learners. This finding is consistent with previous research that has shown that the use of metacognitive strategies can enhance reading comprehension (Flavell, 1979; Oxford, 2011). The

results of the current study suggest that incorporating metacognitive strategies into foreign language instruction can be an effective way to enhance reading comprehension.

The multivariate analysis of variance (MANOVA) revealed that language proficiency had a significant effect on the relationship between metacognitive strategies and reading comprehension, while gender and age did not. This finding is consistent with previous research that has shown that language proficiency can influence the effectiveness of metacognitive strategies in foreign language learning (Mokhtari & Reichard, 2002; Zhang & Wu, 2016). These results suggest that learners with higher language proficiency may benefit more from the use of metacognitive strategies in reading comprehension.

The high level of reliability of the questionnaire used in this study, as indicated by the Cronbach's alpha value, suggests that the instrument was internally consistent and reliable. This supports the validity of the results obtained in the study and indicates that the questionnaire can be used in future research on metacognitive strategies and reading comprehension.

In conclusion, this study provides evidence that the use of metacognitive strategies can enhance reading comprehension in second language learners. The findings suggest that incorporating metacognitive strategies into foreign language instruction can be an effective way to improve reading comprehension. However, the study also highlights the importance of considering individual differences such as language proficiency when implementing metacognitive strategies. Future research could explore the effectiveness of metacognitive strategies in other aspects of foreign language learning, such as writing and speaking. Additionally, the effectiveness of metacognitive strategies could be examined in different learning contexts, such as online or blended learning environments.

The study's reliability analysis showed that the questionnaire used to measure metacognitive strategies and reading comprehension was reliable and internally consistent. The high level of reliability indicates that the questionnaire is an effective tool for measuring the constructs of interest. The study provides evidence that metacognitive strategies are an effective tool for improving reading comprehension in second language learners. The study's findings support the notion that metacognition plays a vital role in language learning and suggest practical strategies for educators seeking to enhance reading comprehension in the classroom. The study's findings have important implications for both language instructors and learners as it emphasizes

the importance of developing metacognitive strategies to improve language learning outcomes.

Conflict of Interest

The author declares no conflict of interest in the conduct of this research.

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