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Investigation of Preschool Teachers' Views of Inclusive Mathematics Education

Okul Öncesi Öğretmenlerinin Kapsayıcı Matematik Eğitimine Yönelik Görüşlerinin İncelenmesi

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Abstract

Inclusive education is based on the belief of having an educational philosophy in which all individuals will acquire the knowledge and skills necessary for their effective inclusion in society. This study aims to examine preschool teachers' views on inclusive mathematics education activities in Turkey. Case study design, one of the qualitative research designs, was used in the study. The study group consisted of 15 preschool teachers. All of the teachers participating in the study were female. The study group was formed by convenient sampling method based on volunteerism. The data were collected through a personal information form and a semi-structured form. Content analysis technique was used to analyse the data. During the analysis of the data, codes and themes were created and visualised using MAXQDA 2024 qualitative data analysis software. According to the results obtained, preschool teachers have deficiencies in preparing differentiated lesson plans and content for inclusive mathematics education. In this context, it is recommended to overcome this deficiency by organising in-service training activities for preschool teachers. Additionally, it is recommended to create guidebooks to assist teachers in implementing inclusive mathematics education activities in preschool.

Keywords: Inclusive education, mathematics education, preschool teacher.

Öz

Kapsayıcı eğitim, bütün bireylerin topluma etkin olarak dâhil olması için gerekli olan bilgi ve becerileri edineceği bir eğitim felsefesine sahip olma inancına dayanmaktadır. Bu araştırma, Türkiye'de okul öncesi öğretmenlerin kapsayıcı matematik eğitim faaliyetlerine ilişkin görüşlerini incelemeyi amaçlamaktadır. Araştırmada nitel araştırma desenlerinden durum çalışması deseni kullanılmıştır. Araştırmanın çalışma grubunu 15 okul öncesi öğretmeni oluşturmaktadır. Araştırmaya katılan öğretmenlerin tamamı kadındır. Çalışma grubu, gönüllülük esaslı uygun örnekleme yöntemiyle oluşturulmuştur. Araştırmanın verileri, kişisel bilgi formu ve yarı yapılandırılmış form aracılığıyla toplanmıştır. Verilerin analizinde ise içerik analizi tekniği kullanılmıştır. Verilerin analizi sırasında, kodlar ve temalar, MAXQDA 2024 nitel veri analiz programı aracılığıyla oluşturulmuş ve görselleştirilmiştir. Elde edilen sonuçlara göre, okul öncesi öğretmenlerin kapsayıcı matematik eğitimine yönelik farklılaştırılmış ders planı ve içerik hazırlamalarında eksiklikleri bulunmaktadır. Bu kapsamda okul öncesi öğretmenlerine yönelik hizmet içi eğitim faaliyetlerinin düzenlenerek

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bu eksikliğin giderilmesi tavsiye edilmektedir. Ayrıca okul öncesinde kapsayıcı matematik eğitim etkinlikleriyle ilgili öğretmenlere yardımcı olacak kılavuz kitapların geliştirilmesi önerilmektedir.

Anahtar Kelimeler: Kapsayıcı eğitim, matematik eğitimi, okul öncesi öğretmen.

Introduction

The world has undergone significant changes due to technological advancements, socio-economic depressions, and wars. These changes have resulted in various issues such as migrations, economic inadequacies, loss of social rights, injustices in the social order, divorces, and gender inequalities. These issues have also affected schools, resulting in a heterogeneous appearance in their structure. Inclusive education is a solution to the problem of heterogeneous classes that societies need to address. Providing individualised education opportunities to students in such classes can effectively determine the development levels of countries (Mazı, 2023). It is important to adopt an inclusive education approach to solve this issue in education systems.

Inclusion is defined as the systematic enrichment or differentiation of the content, environment, strategies, methods and techniques used in teaching and the products produced in order to overcome existing barriers and involve disadvantaged students in education (Slee & Allan, 2001). The fundamental principle of inclusive education is that no individual should be excluded from the education system based on factors such as disability, gender, ethnicity, socioeconomic status, health, or academic achievement. This approach aims to provide education to all individuals (Tomlinson, 2017). The philosophy of inclusive education involves the participation of all children in the education process, the use of curricula and course content that consider individual differences, and the connection of students' learning outcomes with school and community life (Monika, Vats & Kour, 2015).

Individuals with different disadvantages and individual differences can be included in education at all levels with guidance. Preschool education is the first stage of education where teachers and parents determine the individual differences of students in the first years of their lives. Determining individual differences among students is crucial for eliminating potential difficulties they may face in their future educational years (Dağlıoğlu, Turupçu Doğan & Basit, 2017). During the preschool period, students begin to recognize their individual characteristics and experiences shaped by their environment (Pehlivan & Acar, 2009; Şahin, Ömeroğlu, Turupçu Doğan, Dağlıoğlu, Bulut, Sabancı, Kukul, Kılıç Çakmak & Karataş, 2018). The quality of the education system is affected by the content of education provided for preschool students' individual differences, as it reflects the value placed on the students.

Preschool students demonstrate rapid development in mathematics and other fields. During early childhood, social, emotional, and mental development is largely completed. Therefore, students should be encouraged to use mathematical thinking in their daily lives (Baykul, 2021). It is essential for students to acquire the ability to use mathematics to solve daily life problems. Inclusive education practices in pre-school mathematics education accept the individual differences of all students. Therefore, educational environments should be arranged accordingly. This implies that curricula should also be arranged accordingly (Kılıç & Özcan, 2020).

Gathering the views of teachers providing inclusive education is essential for improving the quality of inclusive education practices (Tuzcuoğlu & Aydın, 2023). Previous literature has explored inclusive education in preschool settings (Dağlıoğlu, Turupcu Doğan & Basit, 2017; Lemay, 2017; Kahriman Pamuk & Bal, 2019; Erçiçek, Günal

& Ünay, 2021; Tuzcuoğlu & Aydın, 2023). Furthermore, there have been studies conducted on the implementation of inclusive education in mathematics courses (Montague, Enders & Dietz, 2011; Rolim, Lima & Lagares, 2017; Karslı Çalamak, Olkun & Sözen Özdoğan, 2021; Ağaç, 2023; Mazı, 2023). However, it is important to note that these studies were conducted in special education or other school types, excluding preschools. Slovkovic and Memisevic (2019) conducted research on mathematics teaching in special education during the preschool period.

Research suggests that inclusive education practices in primary school mathematics lessons can enhance student achievement and improve teaching efficiency and effectiveness (Mazı, 2023). However, no research has been found that examines the views of preschool teachers on inclusive education practices in mathematics education. Therefore, this study aims to contribute to the existing literature. To determine the quality of inclusive education practices in preschool mathematics education, it is important to consider the views of teachers on how pre-school teachers use inclusive education practices in their lessons. This study aims to reveal preschool teachers' perspectives on inclusive education practices in mathematics education. The research problem is "What are the views of preschool teachers on the use of inclusive education practices in mathematics education?". The sub-problems are:

1. "What are the views of teachers about the opportunities they offer for students' individual differences in inclusive education practices?"
2. "What are the views of teachers on the selection of materials in the mathematics education of inclusive education practices?"
3. "What are the views of teachers on the selection of strategies, methods and techniques in mathematics education of inclusive education practices?"
4. "What are the views of teachers on the differentiation of content in the mathematics education of inclusive education practices?"
5. "What are the views of teachers on the measurement and evaluation methods in mathematics education of inclusive education practices?"

Method

This study employed a case study design, which is a qualitative research method, to investigate preschool teachers' perspectives on inclusive mathematics education. Case studies aim to answer questions related to how and why, and the researcher attempts to provide a detailed explanation of a phenomenon or event that they cannot control. Cases may appear in various forms. Individual, institution, group and environment can be given as examples of cases to be studied. Case studies can be conducted with a quantitative or qualitative approach. In both approaches, the aim is to reveal results related to a specific situation. The most basic feature of qualitative case studies is the in-depth investigation of one or more situations. In essence, a holistic approach is taken to analyse the factors related to a given situation, including the environment, individuals, and events, among others. The focus is on how these factors impact the situation and how they are impacted by it. It is important to note that generalisation is not possible due to the unique nature of each case study. However, the results obtained from a particular situation can serve as examples and provide insights for understanding similar situations (Yıldırım & Şimşek, 2021).

Study Group

The research study selected its participants from preschool teachers working in Ankara province during the 2023-2024 academic year, using convenience sampling. This technique was chosen due to its cost and time efficiency (Yıldırım & Şimşek, 2021). The study group comprised of 15 female preschool teachers. Table 1 displays the distribution of demographic information regarding the study group.

Table 1. Participants Demographic Info

Variables	Groups	n	%
Age	22-25	1	.06
	26-30	1	.06
	31-35	1	.06
	36 years and over	12	.80
Seniority	1-5	2	.13
	6-10	3	.20
	11-15	7	.46
	16-20	2	.13
	20 years and later	1	.06
Status of Receiving Inclusive Education	Yes	12	.08
	No	3	.02
Code Name: FT1			

Table 1 shows the distribution of teaching experience among the interviewed teachers. 2 teachers have 0-5 years of experience, 3 teachers have 6-10 years of experience, 7 teachers have 11-15 years of experience, 2 teachers have 16-20 years of experience, and 1 teacher has more than 20 years of experience. When the age ranges of the interviewed teachers are analysed; 1 teacher is 22-25 years old, 1 teacher is 26-30 years old, 1 teacher is 31-35 years old and 12 teachers are 36 years old or older. Twelve preschool teachers participating in the study had previously received training on inclusive education. However, 3 teachers have never received any training on inclusive education. Finally, all of the preschool teachers interviewed were female.

Data Collection Tools

This section provides details of the data collection instruments used in the study. The study employed the "Personal Information Form" and the "Semi-structured Interview Form" as data collection tools.

Personal Information Form

This form was developed by the researcher to collect information on gender, age, seniority and the status of inclusive education.

Semi Structured Interview Form

The study employed a semi-structured interview form as a data collection tool. The form comprises five questions, and expert opinion was consulted during the development phase. The interview questions are given below.

1) What are the benefits of inclusive education for children with special education needs, refugees and immigrants in mathematics?

2) What do you look for when choosing materials for teaching mathematics to your pupils in the context of inclusive education?

3) When teaching mathematics within the scope of inclusive education, which methods do you follow to consider the individual characteristics of your students?

4) How can mathematics course content be differentiated for students within the scope of inclusive education?

5) What assessment and evaluation methods do you use when teaching mathematics to your students in the context of inclusive education?

Data Collection Process

Ethics committee permission was obtained from Necmettin Erbakan University before commencing the research. The teachers were informed about the research in detail and their consent for participation was obtained. Subsequently, face-to-face interviews were conducted with 15 preschool teachers who had volunteered to participate in the study. Their opinions were recorded in writing during the interview process. In this context, the teachers granted permission. Interviews lasted approximately 15-20 minutes.

Data Analysis

Preschool teachers' views on inclusive mathematics education were obtained through a semi-structured interview form. Content analysis technique was used to analyse the data obtained. As a result of the content analysis, themes and codes were created. Then, tables were created in which the opinions on the subject could be seen separately. MAXQDA 2024 qualitative data analysis software was used to analyse the data. Through this programme, codes and themes were created in computer environment. Finally, codes and themes were visualised. Additionally, Miles and Huberman (1994) equation was used to assess the reliability of data analysis using content analysis. The reliability value for the identified themes and codes was .91.

Validity and Reliability

The validity and reliability of qualitative research are determined through four stages: credibility, transferability, dependability, and confirmability. These stages were identified by Yıldırım and Şimşek (2021). To ensure credibility, this study utilized expert opinion, long-term interaction, depth-oriented data collection, and participant confirmation. An expert in the field of preschool education was consulted for the research process. Detailed descriptions of preschool teachers' opinions for transferability have been included. To ensure dependability, the consistency of the qualitative data in terms of themes and codes resulting from the data analysis was compared with a doctoral expert in preschool education. Great care was taken to prevent errors in this study. During the confirmability stage, conclusions were based on the raw data. A consistent and interconnected process was followed from data collection to analysis and interpretation of results.

Findings

This section analyses and presents the teachers' answers to the questions asked, using tables and direct quotations from their responses. The tables also provide the frequencies of the codes resulting from the content analysis. The theme and codes created for the first sub-problem of the research are shown in Table 2.

Table 2. Theme of Student Success

Theme	Codes	f	Teacher opinion samples

Success	Equal opportunities	10	*"It provides an opportunity for disadvantaged students to learn." T1.*
			"It provides equal opportunities for children, minimising disadvantages and ensuring that they receive education under the same conditions." T2.
			"All children receive equal opportunities for education, regardless of their upbringing." T4.
			"It offers a distinctive, straightforward, and comprehensible educational opportunity." T6.
			"Ensuring equal opportunities for all children is crucial for providing them with the same education." T7.
			"It provides equal opportunities to all children, allowing them to receive an education in the same environment and at the same time without discrimination." T8.
	Individual differences	5	*"It offers simple, straightforward teaching that all children will understand." T3.*
			"I take care of them individually according to their needs. I help them adapt to others." T10.
			"Supporting children by considering their individual needs ensures equality in education." T12.
			"Individual guidance and support is provided according to the individual needs of the children." T13.
			"It has benefits in terms of taking into account the individual needs of my students." T15.

Upon analysing Table 2, it is evident that 66.67% (f=10) of the preschool teachers mentioned the importance of equal opportunities for success in inclusive mathematics education practices. Furthermore, 33.33% (f=5) of preschool teachers noted that individual differences support differentiation in teaching. Preschool teachers have stated that using inclusive education practices for disadvantaged students can contribute to their mathematics achievement. The theme and codes developed for the second sub-problem are presented in Table 3.

Table 3. Theme of Student-Centred

Theme	Codes	f	Teacher opinion samples
Student-centred	Age	12	*"I ensure that the content is appropriate for the intended child's level of development, needs, and educational goals." T11.*
			"I consider the age range of the children." T2.
			"I make sure that it is suitable for children's levels. I pay attention to its adaptability to real life." T4.
			"I ensure that the materials are suitable for the children's level, simple and concrete, and take into account their interests and individual differences." T8.
			"I ensure that the materials are suitable for the children's needs and developmental levels, and that the learning outcomes are appropriate." T9.
			"I consider age appropriateness, attractiveness, and understanding

			by encouraging hands-on experience." T10.
			"Firstly, I focus on visual perception, presenting information from the familiar to the unfamiliar to maintain their attention and ensure it is appropriate for their age and developmental level." T13.
	Active involvement	3	*"I ensure that learners acquire knowledge through active participation and experiential learning." T3.*
			"I have used Lego and toys that encourage active participation." T1.
			"I ensure that they participate actively, starting with simple tasks and progressing to more complex ones, where they can learn by doing and gaining experience." T6.

Upon examining Table 3, it was found that 80% (f=12) of the preschool teachers' opinions on inclusive education practices in mathematics education highlighted the significance of age when selecting materials related to the student-centred theme. Furthermore, 20% of preschool teachers (f=3) emphasised the importance of active participation in the selection of materials for the student-centred theme. In this context, the importance of selecting age-appropriate materials and student-centred themes to ensure active participation is emphasised by preschool teachers who use inclusive educational practices in mathematics. The theme and codes developed for the third sub-problem are presented in Table 4.

Table 4. Theme of Method

Theme	Codes	f	Teacher opinion samples
Method	Classic	13	*"I have used the strategies I learned during my undergraduate education. For instance, I can teach through invention or presentation." T15.*
			"I use problem solving, presentation and invention teaching." T13.
			"I used teaching through presentation, invention and problem solving." T12.
	Technology	2	*"I have use different teaching methods, such as teaching through play, using concrete examples, or coding." T4.*
			"In mathematics lessons, I use applications that require technology and coding." T14.

Upon analysis of Table 4, it was discovered that 86.67% (f=13) of the preschool teachers held the opinion that the classical method was used for the method theme in inclusive mathematics education practices. Additionally, 13.33% (f=2) of the preschool teachers acknowledged the contribution of technology to the method theme. In this context, preschool teachers reported using classical teaching methods and techniques for inclusive mathematics education. However, they also acknowledged the importance of incorporating technology into their lessons. The theme and codes developed for the fourth sub-problem are presented in Table 5.

Table 5. Theme of Individual Characteristics

Theme	Codes	f	Teacher opinion samples

Individual characteristics	Audio-visual	9	*"I aim to present the information in a way that is easily understandable for children and engages all their senses." T11.* *"I have used audio-visual resources in my lessons." T10.* *"I use visual, auditory and tactile elements to organise the content of the course." T7.* *"Using visual and auditory aids that engage multiple senses, I tailor the course content to each child's individual characteristics." T12.*
	Interest	6	*"I have structured the course content to engage children's interest." T8.* *"I adapt the course content to meet the individual needs of the students and to keep them engaged." T15.* *"I tailor the course content to suit the skills and interests of the children." T4.*

Upon analysing Table 5, it is evident that 60% (f=9) of the preschool teachers surveyed believed that the use of audio-visual materials related to personal characteristics was necessary for inclusive education practices in mathematics education. Moreover, 40% (f=6) of teachers considered it necessary to use audio-visual materials on personal qualities. It was determined that preschool teachers thought that the use of audio-visual materials related to personal characteristics and needs assessment would be effective when using inclusive education practices in mathematics education. The theme and codes developed for the last sub-problem are presented in Table 6.

Table 6. Theme of Mixed

Theme	Codes	f	Teacher opinion samples
Mixed	Observation	8	*"I assess using techniques like observation and checklisting." T12.* *"I observe and assess students' progress using checklists." T13.* *"I use visual, auditory and tactile elements to organise the content of the course." T7.* *"Using visual and auditory aids that engage multiple senses, I tailor the course content to each child's individual characteristics." T1.*
	Q&A	7	*"Use straightforward questions, riddles, and rhymes about animals." T8.* *"I evaluate using open-ended questions and games." T3.* *"I may use open-ended questions, the question and answer method, or the problem solving approach." T4.* *"I employ a variety of teaching methods such as portfolios, concept maps, question and answer sessions, demonstrating and acting." T7.* *"I prefer using methods such as question-answer and open-ended questions." T8.*

Upon analysing Table 6, it is evident that 53.34% (f=8) of the preschool teachers' opinions on inclusive education practices in the mathematics course emphasised the significance of using observation for the mixed theme. Conversely, 46.66% (f=7) of the pre-school teachers' views on the contribution of the question and answer used for the

mixed theme were identified. In this context, it has been determined that preschool teachers use observation and question-and-answer techniques interchangeably in their inclusive mathematics education practices. Figure 1 shows the code cloud, which includes codes and themes generated through content analysis.

Figure 1. Cloud of Codes

Conclusion, Discussion and Suggestions

This study aimed to investigate preschool teachers' perspectives on inclusive mathematics education. The teachers' views were explored regarding student achievement, student-centred education, teaching strategies, individual needs, and the use of mixed assessment and evaluation techniques. The results were discussed in an integration context.

As a result of the first sub-problem of this study, "What are the views of teachers about the opportunities they offer for students' individual differences in inclusive education practices?", preschool teachers reported that inclusive education practices increase student performance in mathematics education. Similar to this result, Mazı (2023) reported that implementing inclusive education practices for 4th grade primary school students in mathematics led to an increase in student achievement. Additionally, Öner (2022) aimed to enhance academic achievement and value development in social studies through inclusive education in secondary school, and the results of the study demonstrated that inclusive education successfully increased academic achievement. In this context, the result of these studies and the current study are consistent with each

other. The aim of inclusive mathematics education is to increase the academic achievement of all students. Therefore, these results also align with the fundamental principles of inclusive education.

As a result of the second sub-problem of this study, "What are the views of teachers on the selection of materials in the mathematics education of inclusive education practices?", preschool teachers reported that they choose student-centred materials for mathematics education in inclusive education practices. Kılıç and Özcan (2020) suggest that preschool mathematics education should focus on the pupil. They recommend using real life objects to gamify the learning process, starting with simple concepts and progressing to more complex ones, while considering the student's age and developmental level. Abercrombie (2009) suggests that a learning environment associated with inclusive education should take into account individual differences in the learning process when selecting materials. The result of the current study is in line with the result of the studies mentioned above. The selection of materials that supports playful learning, takes into account the individual characteristics of the pupils and is pupil-centred is part of an effective inclusive preschool mathematics education.

As a result of the third sub-problem of this study, "What are the views of teachers on the selection of strategies, methods and techniques in mathematics education of inclusive education practices?", preschool teachers stated that inclusive education practices do not use differentiated instruction in mathematics education. It can be argued that preschool teachers lack sufficient knowledge about inclusive education. According to Ağaç and Öztürk's (2022) research, which examines the competencies of classroom teachers in inclusive mathematics activities (IME) and the problems they face, teachers encounter various difficulties during the implementation process. Furthermore, it was revealed that the teachers did not consider themselves to be sufficiently competent in terms of inclusive education. In addition, Aydın and Tuğluk's (2020) study, which focused on adapting content to suit the characteristics of students in preschool education, the teachers' lack of knowledge on the subject posed a significant problem. Furthermore, Kahriman Pamuk and Bal (2019) conducted a study to examine preschool teachers' views on the language development process, which is carried out through adaptations in the preschool period and is associated with inclusive education. The study found that preschool teachers acknowledge the necessity of inclusive education. However, they face difficulties in linking inclusive education with the language development process. Additionally, Ünal and Aladağ (2020) conducted a study to determine the educational practices and problems of teachers with inclusive students in their classes. They also aimed to identify the expectations and solution suggestions for inclusive education. Similarly, Tuzcuoğlu and Aydın (2023) investigated the views, problems, and solution suggestions of preschool teachers regarding inclusive education. The study concluded that some preschool teachers did not feel prepared for the inclusive education process. Additionally, those who did feel prepared had incorrect and incomplete information. The result of the aforementioned studies is comparable to those of the current study. It can be concluded that addressing the deficiencies identified in the study, such as some preschool teachers feeling inadequate for the inclusive education process and those who feel adequate having incorrect and incomplete information, will support students' learning. Therefore, it is believed that this research will make a valuable contribution to the related literature.

As a result of the fourth sub-problem of this study, "What are the views of teachers on the differentiation of content in the mathematics education of inclusive education practices?", it was concluded that preschool teachers prepare course content by

taking into account the individual characteristics of students in mathematics education of inclusive education practices. Tuzcuoğlu and Aydın (2023) found that preschool teachers create an inclusive classroom environment by preparing course content based on individual students' characteristics, differentiate the selected materials according to students' characteristics, involve the entire class in the learning process, and provide sufficient time and opportunities for students' learning. Similarly, Dağlıoğlu et al. (2017) found that preschool teachers take into account the individual differences of their students. The above-mentioned studies show characteristics that are similar to those of this study. Preschool teachers favour differentiation both in the content of their teaching and in the educational environment when implementing inclusive education activities in their classrooms. Furthermore, it can be stated that these teachers take into account the individual characteristics of their students and ensure that they allocate sufficient time to perform these activities, thus making differentiation effective in inclusive mathematics activities.

As a result of the last sub-problem of this study, "What are the views of teachers on the measurement and evaluation methods in mathematics education of inclusive education practices?", preschool teachers reported that mixed measurement and evaluation methods should be used in mathematics course of inclusive education practices. Upon examination of the related literature, it is evident that all classroom teachers who participated in the study conducted by Ağaç and Öztürk (2022) were aware of the significance of conducting assessment and evaluation studies within the scope of inclusive mathematics education (IME). However, some teachers did not engage in assessment and evaluation due to a lack of knowledge about inclusive mathematics activities. According to Ergin's (2022) study, evaluating individual student development and using diverse assessment and evaluation methods in inclusive education practices can be challenging. In this context, preschool teachers reported using mixed methods for measurement and evaluation activities in inclusive mathematics education. However, it was found that they were unable to use this method effectively due to their lack of knowledge in the studies mentioned. This situation is believed to make a valuable contribution to the existing literature. Based on the results of the study, the following suggestions are made for researchers.

- It is recommended that teachers participate in in-service programmes to address their lack of knowledge about inclusive education.
- It is suggested that teacher training programmes include a course on inclusive education as a compulsory component to address the issue of diverse classroom environments that pre-school teachers may face.
- It is recommended that a handbook with lesson plans, content and examples of assessment and evaluation that incorporate inclusive education practices in different courses be printed and made available to teachers so that they can select materials and adapt course content to individual differences.

Ethical approval

The ethics committee approval of this study was obtained from Necmettin Erbakan University on 15.03.2024 with the decision number 2024/248. Additionally, this article was written without the use of artificial intelligence. The research was conducted ethically and without any violations.

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