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Assessment of Basic Learning Levels in Primary School Students in Mathematics

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Abstract

Education plays a crucial role in overcoming societal disparities and empowering marginalized communities in India (Das, 2013). To improve educational outcomes, the State and Central governments have implemented programs like Sarva Shiksha Abhiyan (SSA), which includes Shishu Shikha Kendras (SSKs) and Madhyamik Shikha Kendras (MSKs) aimed at enhancing the quality of education for children aged 6-14. These centers cater to areas lacking adequate primary and upper primary schools. Despite these efforts, learning deficiencies remain a concern, particularly in the field of mathematics. Studies have shown that students in higher grades (V-VIII) often struggle with tasks meant for lower grades (I-IV) (ASER, 2016). Even after completing primary education, many students lack basic mathematical skills. This study aimed to explore and compare the mathematics proficiency levels of Class III and Class V students in SSKs, MSKs, and general schools under the West Bengal Department of School Education to assess the impact of these educational interventions.

Keywords: *Basic Learning Levels, School Students, West Bengal.*

1. Introduction

Education is a fundamental right for every child and plays a crucial role in shaping individuals to be personally independent, socially competent, and vocationally skilled **(Sindhu, 2014)**. It is instrumental in societal development and the enhancement of human virtue **(Genelza, 2022)**. Recognizing its significance, India amended its Constitution in 2002 to ensure that education is a fundamental right, with free and compulsory education for children aged 6-14 years. This spans eight years of elementary schooling, consisting of five years of primary education and three years of upper primary

education, supported by the **Sarva Shiksha Abhiyan (SSA) and Right to Education (RTE) Act (2009)**.

Elementary education establishes the foundation for future learning, and its quality is of paramount importance.Quality education ensures that children acquire grade-appropriate cognitive and learning skills taught by competent, trained educators in adequately equipped educational institutions **(Mupaand & Chinooneka, 2015)**. Government initiatives such as the District Primary Education Programme (DPEP), Integrated Child Development Schemes (ICDS), and Sishu Shiksha Karmosuchi (SSK) aim to empower marginalized groups, particularly in rural and underprivileged areas.

In West Bengal, SSKs and MSKs were established to provide education for children from disadvantaged communities. These educational institutions, though essential, face challenges such as insufficient teacher training and governance issues compared with regular government schools. Despite their success in addressing educational needs, concerns regarding equity and quality persist. To ensure their effectiveness, regular assessments and systematic reforms are necessary to address these challenges and guarantee a sustainable impact on marginalized children's education.

2. Rationale for the Study

Mathematics is a foundational subject that plays a pivotal role in developing critical thinking, problem-solving, and logical reasoning skills among students **(Mangal, 2002)**. Despite its significance, reports such as the Annual Status of Education Report (ASER) and National Achievement Survey (NAS) consistently highlight the persistent learning gaps in mathematics among primary school students in India **(ASER Centre, 2016)**. Many students, even after completing primary education, struggle with basic numeracy skills, indicating a fundamental deficiency in the teaching-learning process.

In West Bengal, the government has implemented targeted initiatives, including Shishu Shiksha Kendras (SSKs) and Madhyamik Shiksha Kendras (MSKs), to improve educational access for children in marginalized and rural communities. These institutions aim to bridge the gap between underserved populations and mainstream education **(Banerjee, 2018)**. However, concerns regarding the quality of education, particularly in mathematics, remain unaddressed. Limited teacher training, inadequate infrastructure, and governance challenges in these centers exacerbate the issue, leaving students ill-equipped to meet grade-level competencies **(UNICEF, 2019)**.

This study is crucial because mathematics education serves as a benchmark for assessing the overall quality of primary education. Proficiency in basic mathematical skills such as number recognition, addition, and subtraction are essential for students' academic success and future learning **(Sindhu, 2014)**. Understanding the factors influencing the numeracy levels of children in Classes III and V across different school settings—SSKs, MSKs, and government schools—can provide valuable insights into the effectiveness of existing educational programs.

Moreover, assessing the disparities in mathematics achievement among boys and girls will help address gender-related inequities in learning. By identifying gaps and proposing targeted interventions, this study aims to contribute to the broader discourse on improving the quality of elementary education and ensuring equitable learning outcomes for all students **(Muralidharan & Zieleniak, 2013)**.

In essence, the rationale for this study lies in its potential to inform policymakers, educators, and stakeholders about the current state of mathematics education in primary schools in West Bengal, paving the way for evidence-based reforms to enhance educational outcomes and promote social equity.

3. Statement of the Problem

Despite educational reforms in India like the Sarva Shiksha Abhiyan (SSA) and the Right to Education (RTE) Act, primary students' foundational math skills remain problematic. Government initiatives, such as Shishu Shiksha Kendras (SSKs) and Madhyamik Shiksha Kendras (MSKs), aim to address educational disparities, especially in rural and underprivileged areas. Nonetheless, many students fail to acquire basic numeracy skills suitable for their grade level. In West Bengal, it is essential to assess and compare students' basic learning levels in SSKs, MSKs, and general government schools. Evaluating whether these alternative education models provide

fundamental math skills, such as number recognition and basic arithmetic, is crucial. Additionally, performance disparities across genders and between students in Classes III and V require thorough investigation to identify gaps and propose targeted interventions. This study aims to assess and compare basic math learning levels among Class III and Class V students in West Bengal's SSKs, MSKs, and government schools, focusing on variations by gender, school type, and grade level. The findings will offer insights into the effectiveness of current educational interventions and inform policy development to enhance primary education quality.

4. Operational Definition

- **Basic Learning Levels in Mathematics:** Basic learning levels in mathematics refer to the following skills for recognizing numbers and computations at the Class I level under WBBPE:
  - Level-1: Beginner level
  - Level-2: Recognition of one-digit numbers (1-9)
  - Level 3: Recognition of two-digit numbers (10-99)
  - Level 4: Addition
  - Level 5: Subtraction
- **School Students:**School students are students studying in classes III and V in schools under WBBPE and WBBSE.

5. Objectives of the Study

The objectives of the study are as follows -

- To compare the basic learning levels of Class III boys belonging to ShishuShiksha Kendra and Government Primary School in Mathematics.
- To compare the basic learning levels of Class III girls belonging to ShishuShiksha Kendra and Government Primary School in Mathematics.
- To compare the basic learning levels of Class III students (boys and girls) belonging to ShishuShiksha Kendra and Government Primary School in Mathematics.
- To compare the basic learning levels of Class-V boys belonging to Madhyamik Shiksha Kendra and Government High School in Mathematics.
- To compare the basic learning levels of Class-V girls belonging to Madhyamik Shiksha Kendra and Government High School in Mathematics.
- To compare the basic learning levels of Class-V students (boys and girls) belonging to Madhyamik Shiksha Kendra and Government High School in Mathematics.
- To compare the basic learning levels of Class III and Class V mathematics children

6. Research Questions

The research questions of the present study are as follows-

- Do Class III boys of Shishu Shiksha Kendra differ from their counterparts in government primary schools in mathematics?
- Do Class III girls in Shishu Shiksha Kendra differ from their counterparts in government primary mathematics schools?
- How do Class III students belonging to Shishu Shiksha Kendra and government primary schools perform in mathematics?
- Do Class-V boys in Madhyamik Shiksha Kendra differ from their counterparts in government high schools in mathematics?
- Do Class-V girls in Madhyamik Shiksha Kendra differ from their counterparts in government high schools in mathematics?
- How do Class V students belonging to MadhyamikShiksha Kendra and Government High School perform mathematics?
- Is the mathematics performance of Class III children the same as that of Class V children?

7. Delimitations of Study

The limitations of the present study are as follows.

- Basic learning levels in mathematics are confined to arithmetic skills for recognizing numbers and computations.
- This study was confined to the Paschim Medinipur District of West Bengal.

8. Need and Significance of the Study

Mathematics is an essential skill that fosters logical, critical, and rational thinking, and must be cultivated from early education

(Hasratuddin et al., 2019). However, numerous students perceive mathematics as challenging, exhibiting a lack of self-confidence, and experiencing difficulties in comprehension. This issue is particularly evident at the primary level, where learning deficiencies can significantly affect future academic performance. Shishu Siksha Kendras (SSKs) and Madhyamik Siksha Kendras (MSKs) function as alternatives to government schools in areas lacking proper facilities. Despite their importance, students in these centers frequently demonstrate poor performance on basic mathematical tasks, as reported in the ASER 2016 study. In contrast to trained and well-remunerated teachers in formal schools, educators in SSKs and MSKs are often untrained and inadequately compensated. The findings of this study will assist educators, teacher trainers, and policymakers in improving the teaching and learning of mathematics for Class III and VI students in SSKs, MSKs, and government schools.

9. Review of Related Literature

The review of the related literature reveals critical insights into the state of education, particularly in the domains of student achievement and systemic challenges. The Annual Status of Education Report (ASER) 2022 highlights alarming gaps in mathematical competencies among students in Stage III, with a substantial proportion unable to perform basic operations, such as subtraction and division. Similarly, the National Achievement Survey (NAS) Report 2021 underscores a significant decline in mathematical achievement as students' progress through higher grades, with average scores dropping from 60% in Class III to 47% in Class X.

Further systemic issues are highlighted in the UDISE (2018-2019) and Periodic Labor Force Survey (2018-2019) reports, which indicate that 7% of schools nationwide are single-teacher institutions, with Goa, Telangana, and states like Jharkhand and Madhya Pradesh reporting even higher percentages. The lack of adequate staffing further complicates the provision of quality education.

Research by **Hasratuddin, Siregar, and Banjarnahor (2019)** in Medan identifies critical weaknesses among junior high school students in areas such as problem-solving, reasoning, and mathematical representation. Similar issues have been reflected in earlier ASER reports. The 2016 ASER report noted that although 96.7% of children aged 6-14 years in rural India are enrolled in schools, only 48% can read at the standard II level. The 2014 ASER report emphasized that dropout rates in primary schools are often linked to socioeconomic factors.

Studies conducted in specific regions have provided a localized understanding of these challenges. **Das (2013)** examines the parallel education system in Murshidabad, West Bengal, revealing its role in perpetuating educational disparities. Similarly, the **Pratichi Report (2009)** highlights the poor quality of instruction in primary schools, where a significant number of children struggle with basic tasks, such as writing their names, and nearly half of the students reported no teaching activity on the day of the survey.

Several studies have explored the factors that impact the quality of education. **Oyo and Cannet (2011)** found that, while teachers and students are generally satisfied with school conditions, the lack of technology and parental involvement adversely affects educational outcomes. **Michael (2015)** identified obstacles in mathematics education, including poorly managed departments, insufficient practice opportunities, and inadequate student preparedness. **Mulwa (2015)** added that students face significant challenges in understanding mathematical terminology and associated concepts.

Efforts to address these issues highlight the need for pedagogical innovation. **Gafoor and Kurukkan (2015)** argued that making mathematics instruction more engaging encourages greater effort and understanding among students. They emphasize the importance of aligning teaching methods with students' beliefs and study strategies.

A comparison of educational systems further enriches this review. **Muhammad (2008)** finds that teachers in public schools are generally more qualified than their counterparts in private schools, suggesting systemic differences in teacher preparation. Collectively, these studies provide a comprehensive picture of the challenges and opportunities within the educational landscape, underscoring the need for targeted interventions to improve student outcomes and address systemic inequities.

10. Research Gap

The existing body of literature highlights significant challenges in the domain of mathematics education and primary school achievement in India. However, critical gaps persist, particularly in the context of foundational mathematics education in West Bengal. While studies such as **Alam and Karmakar (2023)** identify rural-urban disparities in mathematics achievement at the Madhyamik level, they do not address foundational learning gaps at the primary stages. Similarly, research by **Mishra (2020)** indicates that girls often outperform boys in mathematics and literacy skills, but lacks specificity regarding the instructional strategies or contextual factors contributing to this trend in West Bengal's unique educational settings. Further, comparative studies, such as those by **Mandal and Sarkar (2020)**, examine disparities in primary education between West Bengal and neighbouring states like Tripura. These studies shed light on enrollment rates, student-teacher ratios, and instructional days, but fail to focus on specific learner outcomes in mathematics or the systemic challenges faced by non-traditional educational institutions such as Shishu Shiksha Kendras (SSKs) and Madhyamik Shiksha Kendras (MSKs). By addressing these overlooked areas, the present study aims to contribute to the discourse on improving quality and equity in primary education.

11. Research Design

A descriptive survey research design was employed to serve the purpose of the present study.

12. Sampling Strategy

The present study was conducted in the Debra Block in the District of Paschim Medinipur, West Bengal. The sample of the study includes ClassIII students of Balabhadrapur Biswakabi Shishu Shiksha Kendra and Shyampur Primary School, along with all Class V students of Shyampur Islamia Madrasha Siksha Kendra and Shyampur Junior High School. A total of 68 students were selected using simple random sampling techniques to meet the study objectives. The detailsof the samples are presented in Table 1

Table 1: School-Wise & Class-Wise Sample of the Study

Class	**SSK**		**Govt. Primary School**		**MSK**		**Govt. High School**	
School	**Balabhadrapur ViswakobiShisuSiksha Kendra**		**Shyampur Primary School**		**Shyampur Islamia Madrasha Sikkha Kendra**		**Shyampur Junior High School**	
III	20		21		-		-	
V	-		-		25		23	
Sub-total	41				48			
Total	89							
Sex	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
III	8	9	7	10	-	-	-	-
V	-	-	-	-	8	9	8	9
Sub-Total	17		17		17		17	
	34				34			
Total	68							

13. Research Tools

To serve the purpose of this study, a research tool entitled "Reading Test in Mathematics" was developed by the researcher. The Reading Test in Mathematics was developed to assess Class I level asthmatic skills in a mathematics-based subject on the prescribed course of the West Bengal Board of Primary

Education. It contains four items: Level-1: Beginner level; Level-2: Recognition of one-digit numbers (1-9); Level 3: Recognition of two-digit numbers (10-99); Level 4: Addition and Subtraction; this test was thus a Class-I level test, where the lowest level of learning in mathematics is the beginner level, that is,the content validity of the research tool was established.

14. Data Collection Procedure

Consent to gather data from children was obtained from the heads of the institutions. The researcher evaluated the mathematical abilities of 17 Class III students using the Mathematics Test on an individual basis. An identical procedure was employed to gather the necessary information from both ClassII students of Shyampur Primary School and Class V students of Shyampur Islamia Madrasha Sikkha Kendra and Shyampur Junior High School. Data were collected from the following four schools.

- Shyampur Junior High School
- Shyampur Islamia Madrasha Sikkha Kendra
- Shyampur Islamia Madrasha Sikkha Kendra
- Balabhadrapur Viswakobi Shisu Siksha Kendra, Shyampur

15. Analysis and Interpretation of Data

The data collected from ClassII and ClassV students through the Reading Test in Mathematics were analyzed using descriptive statistics. A detailed account of the analysis and interpretation of data relating to ClassI level reading ability in the arithmetic skills of Class II and Class V children is given below.

15.1. Basic Learning Levels in Mathematics

Table 2: Basic Learning Levels of Boys of Class III in Mathematics

Level	Shisu Siksha Kendra	Government Primary School	Total
L-1: Beginner Level	2(22.22)	0(0)	2(10)
L-2: Number Recognition Level(1-9)	4(44.44)	4(36.36)	8(40)
L-3: Number Recognition Level(10-99)	0(0)	1(9.09)	1(5)
L-4: Addition Level	3(33.33)	0(0)	3(15)
L-5: Subtraction Level	0(0)	6(54.54)	6(30)
Total	9 (100)	11 (100)	20 (100)

Each cell in Table 2 shows that Class III boys at Shisu Siksha Kendra (SSK) and Government Primary School (GPS) show notable differences in mathematics skills. About 22% of boys with SSK are at the Beginner Level, unable to recognize one-digit numbers, while 44% can recognize them. In contrast, 36% of boys with GPS can recognize one-digit numbers.SSK enables 33% of boys to perform one-digit addition, but none can perform one-digit subtraction. Meanwhile, 55% of boys with GPS can perform one-digit subtraction, but none can perform addition subtraction.

Table 3: Basic Learning Levels of Girls of Class III in Mathematics

Level	Shisu Siksha Kendra	Government Primary School	Total
L-1: Beginner Level	2(25)	0(0)	2(14.26)
L-2: Number Recognition Level(1-9)	3(37.5)	3(50)	6(42.86)
L-3: Number Recognition Level(10-99)	0(0)	0(0)	0(0)
L-4: Addition Level	3(37.5)	0(0)	3(21.42)

L-5: Subtraction Level	0(0)	3(50)	3(21.42)
Total	8 (100)	6 (100)	14 (100)

Each cell in Table 3 shows that Class III girls at Shisu Siksha Kendra (SSK) and Government Primary School (GPS) show distinct differences in mathematics skills. Approximately 38% of girls with SSK and 50% of girls with GPS can recognize class-I level one-digit numbers. Neither group could recognize the two-digit numbers. While 38% of SSK girls can perform one-digit addition, none of the girls can perform GPS.Conversely, 50% of girls can perform one-digit subtraction, but none of the girls can.

Table 4: Basic Learning Levels of Children (Boys & Girls) of Class III of ShisuSiksha Kendra & Government Primary School in Mathematics

Level	Total
L-1: Beginner Level	04 (05.88)
L-2: Number Recognition Level(1-9)	14 (41.47)
L-3: Number Recognition Level(10-99)	01(02.94)
L-4: Addition Level	06 (17.64)
L-5: Subtraction Level	09 (26.47)
Total	34 (100)

Each cell in Table 4 shows the highest level in mathematics for class III children of ShisuSiksha Kendra (SSK) and Government Primary School (GPS) as a whole. In classIII, nearly 6% of the children could not even recognize class-I level one-digit numbers*(1-9),* while nearly 41% could. Nearly 3% could recognize class I two-digit numbers*(10-99)* but nearly 18% could perform one-digit number addition and nearly 26%could perform classI one-digit number subtraction in mathematics.

Table 5: Basic Learning Levels of Boys of Class V in Mathematics

Level	Madhyamik Siksha Kendra	Government High School	Total
L-1: Beginner Level	2 (22.22)	0 (0)	2 (10.52)
L-2:Number Recognition Level (1-9)	0 (0)	3 (30)	3 (15.79)
L-3:Number Recognition Level(10-99)	3 (33.33)	0 (0)	3 (15.79)
L-4: Addition Level	2 (22.22)	3 (30)	5 (26.31)
L-5: Subtraction Level	2 (22.22))	4 (40))	6 (31.58)
Total	9 (100)	10 (100	19 (100)

Each cell in Table 5 shows Class V boys at Madhyamik Siksha Kendra (MSK) and Government High School (GHS) show varying math skills. Approximately 22% of MSK boys cannot recognize class-I level one-digit numbers, compared to 30% of GHS boys. 33% of boys with MSK can recognize two-digit numbers, while boys with GHS cannot. In one-digit subtraction, 40% of boys with GHS and 22% of boys can perform it.

Table 6: Basic Learning Levels of Girls of Class V in Mathematics

Level	Madhyamik Siksha Kendra	Government High School	Total
L-1: Beginner Level	2 (25)	0 (0)	2 (13.33)
L-2: Number Recognition Level(1-9)	2 (25)	2 (28.57)	4 (26.67)
L-3: Number Recognition Level(10-99)	3 (37.5)	0 (0)	3 (20)
L-4: Addition Level	1 (12.5)	2 (28.57)	3 (20)
L-5: Subtraction Level	0 (0)	3 (42.86)	3 (20)
Total	8 (100)	7 (100)	15 (100)

Each cell in Table 6 shows the highest level in mathematics for class V girls of MadhyamikSiksha Kendra (MSK) and Government High School (GHS).Nearly 25% of class-V girls in MSK cannot even recognize one-digit numbers*(1-9)* whereas nearly the same percentage in MSK and 29% in GHS can. Nearly 13% of class-V MSK girls performed one-digit addition; however, none of them were capable of performing one-digit subtraction. Almost 43% of class-V GHS girls performed one-digit subtraction, compared to nearly 29% at the one-digit addition level.

Table 7: Basic Learning Levels of Children (Boys & Girls) of Class V of MadhyamikSiksha Kendra & Government High School in Mathematics

Level	Total
L-1: Beginner Level	04 (11.76)
L-2: Number Recognition Level (1-9)	07 (20.59)
L-3: Number Recognition Level (10-99)	06 (17.64)
L-4: Addition Level	08 (23.52)
L-5: Subtraction Level	09 (26.47)
Total	34 (100)

In each cell in Table 7, In Class V, students at Madhyamik Siksha Kendra (MSK) and Government High School (GHS) showed varying levels of math proficiency. About 12% of students were unable to recognize one-digit numbers (1-9) at the Class I level, while roughly 21% could. Approximately 18% could recognize two-digit numbers (10-99), with 24% demonstrating proficiency in this area. Additionally, approximately 26% of the students were capable of performing Class I level subtraction. These figures reflect the varying levels of mathematical achievement among the students.

Table 8: Basic Learning Levels of Class-III Children (Boys & Girls) in SSK & GPS and Class-V Children (Boys & Girls) in MSK &GHS in Mathematics

Level	Class-III	Class-V
L-1: Beginner level	04 (05.88)	04 (11.76)
L-2: Number Recognition Level(1-9)	14 (41.47)	07 (20.59)
L-3: Number Recognition Level(10-99)	01 (02.94)	06 (17.64)
L-4: Addition Level	06 (17.64)	08 (23.52)
L-5: Subtraction Level	09 (26.47)	09 (26.47)
L-1: Beginner level	34 (100)	34 (100)

Table 8 highlights the highest level of mathematical proficiency among third- and fifth-grade students in SSK, GPS, MSK, and GHS. About 6% of third-grade students and 12% of fifth-grade students could not identify one-digit numbers (1-9) at the first-grade level, while 41% of third-grade students and 21% of fifth-grade students could. Less than 3% of third-grade students and 18% of fifth-grade students could identify two-digit numbers (10-99).There is a slight difference in one-digit addition performance, with 18% of third graders and 24% of fifth graders. Both groups showed equal proficiency (26.47%) in one-digit subtraction.

16. Major Findings of Study

16.1. Class III boys and Girls of SSK and GPS

In third grade, nearly 22% of boys in the School for Structured Knowledge (SSK) are at the beginner level and are unable to recognize one-digit numbers. However, more boys in SSK can recognize one-digit numbers (1-9) compared to those in General High School (GHS). None of the boys in the General Public School (GPS) could perform one-digit addition, and no boys in SSK could perform one-digit subtraction at the first-grade level. Neither third-grade girls in SSK nor GPS could recognize two-digit numbers, and neither group could perform one-digit addition or subtraction. Approximately 6% of third-grade children cannot recognize one-digit numbers, 3% can recognize two-digit numbers, 18% can perform one-digit addition, and 26% can perform one-digit subtraction at the first-grade level.

16.2. Class-V boys and Girls of MSK&GHS

In class V, about 22% of boys in MSK could not recognize one-digit numbers at the class I level, while 30% of boys in GHS could. Nearly 33% of MSK boys can recognize two-digit numbers, but none of the boys in the GHS can. For girls, 25% of MSK students could not recognize one-digit numbers, and 13% could perform one-digit addition, but none could perform one-digit subtraction. In GHS, 43% of girls can perform one-digit subtraction and 29% can perform one-digit addition. Overall, 12% of class V children could not read one-digit numbers, 18% could read two-digit numbers, 24% could perform addition, and 26% could perform subtraction.

16.3. Class-III and Class-V Children of All the Schools

In class V, 12% of children struggled to identify one-digit numbers at the class I level, compared to 6% in class III. Conversely, 41% of class III children could recognize one-digit numbers at the class I level, while only 21% of class V children could. Less than 3% of class III children could identify two-digit numbers, whereas nearly 18% of class V children could. The gap in one-digit addition proficiency between class III (18%) and class V (24%) was approximately 6%.Both class III and V children demonstrated equal proficiency in one-digit subtraction.

17. Conclusions

The primary results of the investigation led to the deduction that Shisu Siksha Kendra (SSK) and Madhyamik Siksha Kendra (MSK) necessitate restructuring to conform to government schools by those who are accountable for establishing educational principles. Educators in government schools should be aware that children in a non-formal educational environment exhibit superior performance compared to those in a formal school environment. Policymakers should also investigate the issue regarding why a considerable number of children in Classes III and V possessed inadequate mathematical literacy. The government, policymakers, and responsible stakeholders of the school education system must evaluate and formulate effective policies, strategies, and action plans to enhance the quality of the system and the competencies of its students in the desired manner.

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