Technology-Based Reading Application on Improving Reading Literacy Level among Struggling Readers in a Public Elementary School in the Philippines

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ABSTRACT

Reading literacy is a fundamental skill essential for academic success and lifelong learning. However, some students in elementary schools face challenges in developing proficient reading skills, leading to academic setbacks. Technology offers innovative solutions to address these challenges and facilitate reading literacy levels among struggling readers. This study assessed the effects of a technology-based reading application READTECH 1.0 on improving the reading literacy level of Struggling Readers in a public elementary school in the Philippines. READTECH 1.0 follows the Analyze, Design, Develop, Implementation, Evaluation (ADDIE) Model in creating learning content. The respondents of this study were 26 Grade Six Struggling Readers. Quantitative methods were used in collecting the data such as conducting pre-and post-reading test assessments. Descriptive Statistics were used to analyze the data and the questionnaires using the five-point Likert Scale. Findings revealed that the implementation of READTECH 1.0 leads to an improvement in the reading literacy level of the Struggling Readers. The integration of technology into education, particularly in the realm of reading, has shown promise in engaging and assisting struggling readers.

Keywords: *literacy level; reading application; struggling readers; technology; technology-based*

INTRODUCTION

To provide a well-rounded education, it is essential to help students improve their reading literacy. Students who cannot read have trouble understanding complicated ideas and concepts, even though reading can improve knowledge, comprehension, and reading experiences, including enjoyment, amusement, education, and knowledge.

The Department of Education (DepEd) recognized the 600,000 students who took part in the global survey known as the Program for International Assessment (PISA) in the 2018 National Report of the Philippines. In comparison to the OECD average of 487 points, Filipino students around the age of 15 scored 340 on the overall reading literacy test. In the Philippines, female students outperformed male students in overall reading literacy by 27 points. (84.82%) Both male and female students did not achieve Level 2 in Overall Reading Literacy. According to the study, the Philippines placed last out of 79 nations (DepEd PISA 2018 National Report). Likewise, according to the national news report, the PISA result for 2022 made it abundantly evident that the Philippine school system is in the worst possible shape. The Philippines was one of the 81 countries under the Organization for Economic Cooperation and Development (OECD) countries with the lowest performance in math, reading, and science. The nation came in at position 79

in reading. The Philippines has a score of 347, or Level 1a, compared to the OECD average of 476, or Level 2 (Hernando-Malipot, 2023). Cabaez (2022) further claimed that the pandemic lowers students' reading literacy levels.

In an interview with UNESCO Director-General Azoulay on International Literacy Day, Cabaez (2022) further claimed that the pandemic lowers students' reading literacy levels: "Despite advances, 771 million young people and adults around the world still cannot read or write. Covid-19 exacerbates the condition."

According to Luz's (2007) research, many students who complete secondary school are either poor readers or do not know how to read. A third of students were labeled as "struggling readers" and a further third as "slow readers," both of which reading scores fall below the level of proficiency in reading that is expected and intended for students in this grade and age group, according to the country's current literacy rate.

In the Functional Literacy Assessment (FLAT) reading exam administered to Grade Six students in the North District, one of the ten schools, only 33 of the 201 students received a fast reader score, 104 received an instructional reader score, and 39 received a frustrated reader score. The results are quite concerning considering that students at their level should be proficient and quick readers with a high level of reading

literacy, but 26 of the 201 students scored below the Low Reading Literacy Level of 0-2 and could be considered "struggling readers" (Bermudo, 2017). According to Scammacca et al. (2015) struggling readers were defined as low achievers, students with unidentified reading difficulties, dyslexia, and with reading, learning or speech/language disabilities.

A student's capacity to learn and achieve in other areas is hampered when they have poor reading comprehension and find it difficult to understand what they are reading. They struggle more to read and understand the material, which makes it more challenging for them to participate in lessons that incorporate concepts from other subject areas (Ulu, 2017). These issues could be caused by students' inability to study and comprehend the subject matter sufficiently enough to pick up on crucial details (Mohammed & Amponsah, 2018). For this issue to be solved, prompt and urgent action is required.

There is no single reading instruction strategy that works for all kids. According to Vacca (2015), it is critical to comprehend the demands of the students. Teachers must have a solid grasp of the different ways to teach reading to students in various contexts. Several studies have been conducted to be able to test different teaching techniques in improving the reading skills and comprehension of the students in English. Lopez and Ortega-Dela Cruz (2022) explored on the gallery walk technique in enhancing reading comprehension and oral English language

proficiency of junior high school students. Mendoza and Ortega-Dela Cruz, (2024); Nabor and Ortega-Dela Cruz (2022) delved on the silent reading methods on improving English reading comprehension among elementary pupils. Nobles and Ortega-Dela Cruz (2020) looked into making connections as a metacognitive teaching strategy whereas Hilao-Valencia and Ortega-Dela Cruz (2023) examined the effect of appreciative inquiry. Meanwhile, the study of Dangan and Ortega-Dela Cruz in 2021 investigated on the effectiveness of English learner's material in enhancing grammatical competence of the students. These studies made use of different teaching techniques. Although there have been initiatives in the use of technology but studies on the effectiveness of which are still lacking, specially in the context of a developing country such as the Philippines.

Hence, the researcher made use of learning technologies by creating learning educational content for READTECH 1.0 using the ADDIE Model as a design framework. Utilizing a variety of programs, including ADOBE XD, LUMI H5P, programming, graphic design, and APK Website Builder. Through this technology, it can be a tool to enhance learning and increase its impact (Huang et al., 2014). Consequently, a reading app for mobile learning powered by technology is not a replacement for a traditional education. Technology, however, presents opportunities for enhancing education outside of the classroom and provides

benefits for a variety of interactions (Sharples et al., 2010).

Dr. Ethel Agnes P. Valenzuela, Director of the SEAMEO Secretariat, mentioned in Child Hope Philippines Website (2021), "*We live in a technologically and digitally advanced era. Let's make the most of them all, keep supporting one another, and work to solve the problems the education sector is currently facing*".

This encourages the use of technology-based reading programs in the instruction of elementary school pupils. An individual's opportunities in life depend on their level of education. Regardless of their other skills, someone who cannot read or write is at a disadvantage. Technological advancements impact every facet of modern life, they will be left behind in a digital environment *(Colbert et al.,2016)*.

With the help of a computerized reading program, students can read more actively. The students' comprehension of the texts is also evaluated as part of this program, which also fosters the development of critical reading literacy abilities like vocabulary, comprehension, fluency, and phonological awareness.

The Philippine Department of Education (2022) has trained teachers to create a program called Webinar Session on the Use and Development of Aklatech 3.0-Book of the Future and Mobile Application Development with OUA Memorandum 00-0622-0138. The training aims to improve teachers' digital literacy to create interactive learning content that can be used in their classes. The researcher is one of the participants who were trained to develop the said program. To apply what was learned in the training, the researcher created the learning content material of READTECH 1.0 following the steps in Instructional System Design of the ADDIE Model in producing a reading application. This was in response to the problems that were encountered with the researcher's pupils.

This study aims to help Struggling Readers in Grade Six in a public elementary school in the Philippines by examining the effects of READTECH 1.0 in improving reading literacy.

Specifically, the study (i) assessed the pre-reading literacy level using the Functional Literacy Assessment (FLAT) to identify the list of Grade Six Struggling Readers; (ii) evaluated the level of effects of READTECH 1.0 in improving the reading literacy level; and (iii) examined the effectiveness of READTECH 1.0 on the post-reading literacy levels as measured by the FLAT.

METHOD
Research Design

The study employed a research design that involved a single-group experiment with a pre-test and a post-test. With this experimental design, a specific group is chosen, and data is gathered by measuring or observing it both before and after treatment. It makes it possible to compare the group's behavior or results before and after the treatment (Fraenkel et al.,2011). In this case, the study aimed to

investigate the effects of READTECH 1.0 in improving reading literacy.

A pre-reading literacy assessment using the FLAT was administered to five sections of Grade Six pupils in a public elementary school. This assessment aims to identify the reading literacy level and the list of struggling pupils.

The post-reading literacy assessment was used to evaluate the effects of READTECH 1.0 in enhancing the reading literacy of identified struggling readers in Grade Six. The evaluation took place after the reading implementation of READTECH 1.0 for 20 days.

Research Participants

The selection of the respondents was done through finding the result of the Functional Learning Assessment Tool (FLAT) pre-reading literacy assessment of 201 Grade Six pupils using the purposive sampling. According to Heath (2023), purposive sampling is a non-probability sampling method employed in research to select a particular group of individuals or units for analysis, thus, participants are purposefully selected based on the following criteria:

a. Children aged 11 to 13
b. Children in Grade Six are transitioning to adolescence.

Using the FLAT and these criteria the researcher was able to identify 26 Struggling Readers determined who became part of the study.

Based on the data gathered, most struggling readers are male, accounting for 58% or 15 individuals. Meanwhile, female struggling readers make up 42% or 11 individuals.

Instrumentation

Pre-Reading and Post Reading Literacy Level using the Functional Literacy Assessment Tool (FLAT)

Functional Literacy Assessment Tool (FLAT) (Department of Education, 2021; World Vision, 2021) was used in scoring the reading literacy level.

Table 1. Functional Literacy Assessment Tool Rating Scale (World Vision, 2021)

FLAT Rating Scale	
Can read nothing	Fewer than 4 out of 5 letters
Can read letters	4 out of 5
Can read common words	4 out of 5
Can read a paragraph of 4 simple sentences	(With no more than 3 mistakes)
Can read a short story	with no more than 3 mistakes
Can read and understand a story	2 out of 3 questions must be answered correctly

The reading literacy levels of pupils were categorized into four groups using the Philippine Informal Reading Inventory and result of FLAT. First, pupils who are struggling readers attained score of 0-2 in FLAT (Struggling Readers) which means those pupils cannot read or recognize a letter and its sound. Second, those who scored 3-4 are interpreted as slow readers (Frustrated Readers), wherein some of the pupils refuse to read because of lack of

confidence. Third, students who have a FLAT score of 5 are classified under instructional reading level (Instructional Readers), wherein they can only read under the supervision of a teacher. Lastly, those who have a FLAT score of 6 are categorized under independent reading level and fast readers; they have a comprehension that can read without assistance and with relative ease (Luz, 2007; World Vision, 2021).

Data Gathering Procedures

After receiving the results of the pre-reading literacy assessment, the researcher created the learning materials for READTECH 1.0. The reading activities in READTECH 1.0 served as teaching aids for one-on-one and group instruction with Struggling readers in Grade Six. Then, the researcher drafted a Daily Learning Plan to direct and guide the proper learning session with the Grade Six Struggling Readers. This was then conducted for 30 minutes every day before the start of the class and was implemented for 20 days. FLAT was used to assess the post-reading literacy assessment results and compare them to the pre-reading literacy results. The main data used to determine whether READTECH 1.0 is a successful technology-based reading application for enhancing reading literacy was the FLAT's findings. Evaluation of READTECH 1.0 and the Daily Learning Plan was carried out using a Google Survey Questionnaire.

Data Analysis

To determine the level of effects of READTECH 1.0 on the reading literacy of the pupils, a five-point Likert scale with interpretation was utilized. This scale consists of five options ranging from Strongly Agree (SA) to Strongly Disagree (SD), with a corresponding numerical value assigned to each option. The values are as follows: 5 for SA, 4 for Agree (A), 3 for Neither Agree nor Disagree (NA), 2 for Disagree (D), and 1 for Strongly Disagree (SD).

To further interpret the results of the Likert Scale, a verbal interpretation was applied. Scores falling between 4.21 and 5.00 were considered Strongly Effective (SE), while scores between 3.41 and 4.20 were considered to have Effective. Scores between 2.61 and 3.40 were interpreted as Neither Effective (NE), while scores between 1.81 and 2.60 were considered No Effects (HNE). Finally, scores between 1.00 and 1.80 were interpreted as Strongly No Effects (SNE). One part that determined the effectiveness of READTECH 1.0 was evaluated based on the feedback received from teachers. This evaluation determined whether READTECH 1.0 has a beneficial effect.

Ethical Considerations

Before the start of this study, the researcher asked permission to the School Division Superintendent about the conduct of the field study. Following the protocol of Division of the City to protect the data privacy of students who participated in the

study to have their identities protected by concealing their names and omitting other important demographic information.

In terms of the development of learning contents for READTECH 1.0, the researcher acknowledges the video authors on the learning contents. The authors' names were written in the Metadata of LUMI APP to give proper credit to the owner of the videos. The researcher has opted to utilize the Attribution-Non-Commercial-Share Alike 4.0 International License Version as a means of clearly communicating that the content is intended exclusively for educational purposes only. In recording of papers and documents, it was kept in a safe place, and only the researcher has full access to the computer files of the result of the surveys.

This research adheres to and abides by the National Ethical Guidelines for Human Participant Research, 2022.

RESULTS AND DISCUSSION

Pre-Reading Literacy Level of Grade Six Struggling Readers

Table 2 provides a breakdown of the number of struggling readers by class. Grade Six-Ruby has a total of eight pupils, while Grade Six-Sapphire has seven pupils. Grade Six-Pearl, on the other hand, has five pupils, while Grade Six-Jade has four.

Lastly, Grade Six-Diamond has the smallest number of pupils with only two.

Moreover, according to the result of the Reading Literacy Level in Grade Six, Grade Six Diamond has 1 or "0" nothing level with a mean of 0.2, Grade Six Pearl (2), Sapphire (2), Ruby (7) and Diamond (1) identified a total of 12 pupils in Letter Level with a mean of 2.4 and in Word Level Grade Six Pearl has 3, Sapphire has 2, and Jade has 4, Word Level has a mean of 1.8. Paragraph Level recorded 3 in Grade Six Sapphire, and 1 in Ruby. Paragraph Level has a mean of .8.

The pre-reading literacy level of students is determined through the administration of the FLAT assessment. The data indicates that students performed more proficiently in the Letter level, as evidenced by a higher mean score. Conversely, the lower mean score of 0.8 in the Paragraph level suggests that students are encountering challenges when attempting to answer questions at this level.

Table 2. Pre-reading literacy level of Grade Six Struggling Readers using the Functional Literacy Assessment Tool (FLAT)

Section	0=Nothing	1=Letter Word	2=Word Level	3=Paragraph Level	4=Story Level	5=Story and Comprehension Level	6=Local material and Comprehension	Total Struggling Readers
Pearl	0	2	3	0	0	0	0	5
Sapphire	0	2	2	3	0	0	0	7
Jade	0	0	4	0	0	0	0	4
Ruby	0	7	0	1	0	0	0	8
Diamond	1	1	0	0	0	0	0	2
Mean	*0.2*	*2.4*	*1.8*	*0.8*	*0*	*0*	*0*	

To ascertain the students' current reading proficiency, a pre-reading evaluation is required. Pre-assessment is a diagnostic tool that, in accordance with Bukhari's research (2019), makes it simpler to layer new concepts over current knowledge building blocks and provides teachers with information about how prepared their students are to learn new concepts. In order to improve reading comprehension, the study investigates the benefits of employing a pre-assessment to ascertain the linguistic competency of the learners. The pre-assessment results allowed the researcher to ascertain the past knowledge of the learners and to make adjustments by adding more challenging tasks or instructional support to the reading comprehension exercise.

Pre-Reading and Post-Reading Literacy Level of Grade Six Struggling Readers

Table 3 shows the effectiveness of post-reading literacy level by comparing the results of pre-reading and post-reading literacy level of Grade Six Struggling Readers. It was found that there were no non-readers in the Nothing Level, Letter Word Level, Word Level, and Paragraph Level categories. It has been observed that both Story and Comprehension levels, as well as Local material and Comprehension, have increased among 15 and 11 pupils, respectively. The meaning affects the Nothing Level, Letter Word Level, Word Level, and Paragraph Level, all of which have a value of 0. Meanwhile, the Story and Comprehension level has a mean of 3, and Local material and Comprehension has a mean of 2.2. This indicates that there are

changes and improvements in the reading literacy of Grade Six Struggling Readers.
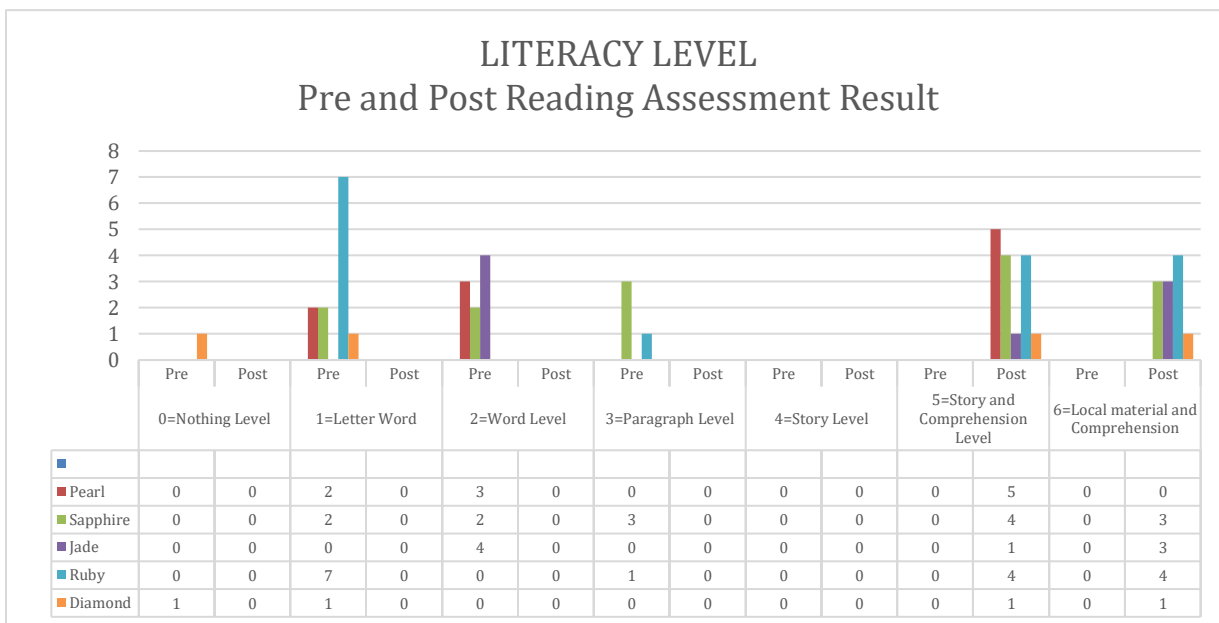
The Phil-IRI categorized the reading level of struggling readers. An Instructional Reader is categorized as the most dominant reader with a flat score of 5 in both Story and Comprehension Levels. In contrast, a flat score of 6 reported 11 readers, meaning there are 11 Independent Readers.

Table 3. Effectiveness of READTECH 1.0 in improving the reading literacy

Pre-and Post-Reading Literacy Level

Section	0=Nothing Level Pre	0=Nothing Level Post	1=Letter Word Pre	1=Letter Word Post	2=Word Level Pre	2=Word Level Post	3=Paragraph Level Pre	3=Paragraph Level Post	4=Story Level Pre	4=Story Level Post	5=Story and Comprehension Level Pre	5=Story and Comprehension Level Post	6=Local material and Comprehe Pre	6=Local material and Comprehe Post	Total Struggling Readers Pre	Total Struggling Readers Post
Pearl	0	0	2	0	3	0	0	0	0	0	0	5	0	0	5	0
Sapphire	0	0	2	0	2	0	3	0	0	0	0	4	0	3	7	0
Jade	0	0	0	0	4	0	0	0	0	0	0	1	0	3	4	0
Ruby	0	0	7	0	0	0	1	0	0	0	0	4	0	4	8	0
Diamond	1	0	1	0	0	0	0	0	0	0	0	1	0	1	2	0
Mean	*0.2*	*0*	*2.4*	*0*	*1.8*	*0*	*0.8*	*0*	*0*	*0*	*0*	*3*	*0*	*2.2*		

Table 4. FLAT scores with corresponding interpretation

FLAT Score	No. of Respondents	Phil-Iri Interpretation Adapted
0-2	0	Struggling Readers
3-4	0	Frustrated Readers
5	15	Instructional Readers
6	11	Independent Readers

	0=Nothing Level		1=Letter Word		2=Word Level		3=Paragraph Level		4=Story Level		5=Story and Comprehension Level		6=Local material and Comprehension	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Pearl	0	0	2	0	3	0	0	0	0	0	0	5	0	0
Sapphire	0	0	2	0	2	0	3	0	0	0	0	4	0	3
Jade	0	0	0	0	4	0	0	0	0	0	0	1	0	3
Ruby	0	0	7	0	0	0	1	0	0	0	0	4	0	4
Diamond	1	0	1	0	0	0	0	0	0	0	0	1	0	1

Figure 1. Literacy Level of Pre and Post Reading Assessment Result

The figure shows that there is a difference in the reading level of Grade 6 Struggling Readers before and after the implementation of READTECH 1.0 as indicated in the difference between the pre-reading and post-reading literacy levels of Grade Six Struggling Readers.

The statement suggests that conducting a study on an individual student's progress after receiving an intervention will enable the researcher to gain a deeper understanding of their growth. It is suggested that researchers consider students who have already been evaluated and are performing at their maximum potential and explore alternative interventions for these students.

This study is unique in its approach to examining the reading literacy proficiency of Grade Six Struggling Readers. Specifically, the study utilized FLAT as a tool for discerning and classifying the proficiency levels of these readers. The study then interprets the results of this classification considering the number of readers categorized through both using the FLAT and Phil-IRI. By doing so, the study aims to shed new light on the reading literacy level of Grade Six Struggling Readers and contribute to the existing body of research on this topic.

In their study, Klimova and Zamborova (2020), they discovered that after using mobile applications to treat the pupils, their reading comprehension had increased. Adopting mobile apps enhanced learner motivation and promoted a positive attitude, according to several research. According to Schalich (2015), in order to accurately assess students'

development, it is essential to deliver the same pre-test and post-test to them.

CONCLUSION

This research investigates the effects of a technology-based reading application on improving the reading literacy level in a public elementary school. The primary data for this study were obtained through the administration of pre-reading literacy assessments to a sample of 201 Grade Six pupils. The assessments were conducted using the FLAT (Formative Literacy Assessment Tool). From this sample, a subgroup of 26 students who were identified as struggling readers were selected as the respondents for the study. Results showed that READTECH 1.0 improved the reading literacy level of Struggling Readers in Letter Level, Word Level, Paragraph Level, Story Level, Story and Comprehension Level, and Local Material and Comprehension Level. READTECH 1.0 is a cost-effective reading intervention that provides free access to parents, learners and teachers of the application. It has also increased the pupil's reading confidence, pupils become more behaved and under control. Learning Competencies provided direct specification of the topics in discussing READTECH 1.0. READTECH 1.0 helps improve the reading skills of pupils such as phonetic skills, CVC, vocabulary, and comprehension.

Nevertheless, it is important to note that the findings of this study cannot be extrapolated to encompass all public elementary schools. To ascertain the efficacy of technology-based reading applications in similar educational settings, further research must be conducted across a broader range of schools.

Developing reading literacy skills is a crucial aspect of education. The researcher recommended enhancements that could be made to READTECH 1.0 to better achieve its objectives. The recommended enhancements to Reading Literacy Improvement are the following:

a. Enhance students' reading literacy and enable them to reach their full potential in this area by continuous usage of READTECH 1.0.

b. READTECH 1.0 is a powerful tool that has proven to be incredibly useful for individuals who struggle with reading, as well as those who are non-readers.

c. Encourage all teachers to be advocates for the ongoing use of READTECH 1.0 to promote reading literacy across all grade levels, ensuring that no readers fall behind.

Moreover, this study has recommended using READTECH 1.0 for Learning Content as follows:

a. Enhancing the learning contents of READTECH 1.0.

b. Continuous development of READTECH 1.0 based on the needs of readers.

c. Training sessions can be provided to teachers to enable them to create their own learning content.

Technology-based reading applications hold great promise in improving reading literacy levels among struggling readers in elementary school. When used strategically and in conjunction with effective teaching methods, these applications can provide personalized, engaging, and accessible resources that empower students to become proficient readers. However, it is essential to address potential limitations and ensure equitable access to technology to maximize the benefits of these tools. Collaborative efforts among educators, parents, and policymakers can pave the way for a brighter future for struggling readers.

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AUTHOR CONTRIBUTION STATEMENT

First Author (MDQ): Literature review, conceptualization, methodology, data analysis, original manuscript preparation

Second/Corresponding Author (ROD): review-editing and writing, journal article preparation.

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