

Reading Proficiency as Predictor of Mathematical Competence of Junior High School Learners

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Abstract— The Department of Education attributed Filipino learners' low academic achievement on their language proficiency. In response to the ongoing challenges in attaining competency level in mathematics in the midst of the COVID-19 pandemic. This study used a descriptive-predictive research design to examine reading comprehension as a predictor of mathematics competence. Furthermore, it seeks to answer if reading comprehension is a predictor of math competence of the learners. Examination of the regression coefficient revealed learners' level of reading proficiency has significant impact on learner's mathematical achievement. Math and English data were acquired with the cooperation of school subject coordinators, while data for learners' profile was gathered from parents during module deliveries, all while complying to the IATF's safety and health protocols. The findings revealed that learners' reading comprehension has a positive or negative impact on their math class achievements. Thus, reading proficiency predicts mathematics competence in Junior High School learners. It also revealed that reading proficiency of learners was under instructional level; while their math competence was of average. Implementing a home-based reading program that encourages parents and home tutors to engaged in their children's reading development, making learning resources available to learners to develop reading and math skills.

Keywords— *Reading proficiency, mathematical competence, cognitive Developmental Theory, theory of Sociocultural.*

I. INTRODUCTION

The performance of Filipino students on large-scale exams like the National Achievement Test (NAT) is generally poor, especially in Science, Math, and English. The National Assessment Test (NAT) is given to students in grades 6, 10, and 12. This issue, according to the Department of Education, is due to learners' low reading comprehension (Education Secretary Leonor Briones, Mainila Bulletin: Year End Report, 2019). One of the most powerful indicators of academic performance is literacy skills (Gail Innis, 201). Based on the department's flagship initiative, "Every Kid A Reader," which aims to make every Filipino kid a reader and writer at his or her grade level, and DepEd memorandum no. 173 s. 2018, literacy is one of the department's key goals (DepEd Order No. 014, s. 2018). The Every Child a Reader Program (ECRAP) will be supported by the "Hamon: Bawa't Bata Bumasa" (3Bs) project in 2019, which aims to give learners with reading abilities that will empower them towards becoming proficient and competent readers at their respective grade level.

According to Akbaşl (2016), educators should highlight the importance of reading comprehension in their classes and design lectures and activities accordingly in their role as mentors to students. Reading is an essential aspect of the educational process because it is required in all topics taught at all levels (Cimmiyotti, 2013). Reading skill has a substantial positive link with mathematical ability, according to research (Ercikan et al., 2015). Many low-achieving students have understanding (reading and comprehending) trouble mathematical word challenges written in English (Education Secretary Leonor Briones, 2019). As a result, they were unable to demonstrate that they had grasped the material. Apart from challenging to meet learning requirements in literacy and numeracy, learners also have low achievement levels in English, Math, and Science (Tirol, 2022) which appears to be driven by gaps in learners' reading ability.

Mathematics is one of the topics in high school that most students find challenging/difficult because they dislike solving, interpreting, and analyzing numbers. Students may think objectively and intelligently by solving and interpreting various types of word problems. As they progress through high school and encounter subjects such as algebra, geometry, trigonometry, and statistics, they will need to develop more mathematical skills and techniques, particularly as these subjects are combined with other disciplines. Reading comprehension has also been identified as one of the most important factors in math achievement. Recognizing that many Filipino students are still struggling to meet early language, literacy, and numeracy targets, the Department of Education (DepEd) has urged all public schools to improve advocacy. Language ability, their reading parental involvement, and the absence of learning disabilities, as well as reading ability, were discovered to be important predictors of academic achievement (Lever et al., 2016).

Teachers of mathematics must assist learners in fully comprehending word problems in order for them to solve them. With such a low level of reading competence, inspiring students to improve their problem-solving skills will be challenging. Additionally, learners' difficulties with language and vocabulary stem from a lack of knowledge of arithmetic education as well as the capacity to participate in discussions about various math topics. Math teachers may need to put in more effort to decipher word difficulties in order to help leaners better understand concepts discussed in Math, which may affect the amount of time allotted for enrichment



activities and other activities that would help students improve their understanding of Mathematical concepts. Teachers may need to incorporate reading and writing tasks to help learners understand, comprehend, and articulate mathematical concepts. In light of this, the researcher designed this study to see if the impact of reading comprehension on students' mathematical competence at Busogon Integrated School Junior High School supports the Department of Education's (DepEd) claim that reading proficiency is one of the significant predictors of academic performance in mathematics.

II. METHODOLOGY

The methodologies utilized in the data collection, presentation, and analysis was covered in this part. The research design, environment, respondents, instruments/data sources, data collection processes, were all discussed. It also showed the type of approach employed in the research study, as well as the criteria used to determine which methodology will be used to answer the designed question. The research design employed in this study was descriptive-predictive. It described the performance level of Junior High School students in reading proficiency and mathematics performance, as well as their total success in the two subjects. It also looked into how closely all aspects of reading skills are linked to pupils' math achievement. Mathematical competency is predicted by a description of the variable reading proficiency. The purpose of using this design was to describe predictive association between reading proficiency and the mathematical competence of the learners and how reading ability affects their academic performance in Mathematics. The research was conducted at Busogon Integrated School, one of the schools in San Remigio District II - Cebu Province Division. It is a public school situated in the northern part of the Cebu Island. It is approximately 125 km from the provincial capital which is Cebu City. It was founded on 1940, from being a Primary School to Elementary School and now as Integrated School. To achieve the Department of Education's goal of promoting every Filipino's right to a high-quality, egalitarian, culturally relevant, and complete basic education that is available to all students. It has over 500 pupils ranging from Kindergarten to Senior High School. The school offers a General Academic Strand for Senior High School, which spans the whole grade level from kindergarten to Grade 6 (Elementary) and Grade 7 to Grade 10 (High School), with a total enrollment of 49 pupils (Junior High School). There are four quarters in the Junior High School academic year. During the second quarter of the 2020-2021 academic year, this research was finished.

The study's respondents were chosen from the entire population.

TABLE 1. Distribution of Respondents					
Respondents (n)					
27					
35					
42					
27					
131					

The researcher gathered data from a population of 131 Junior High School Learners in Busogon Integrated School. A total number of 131 respondents composed of 27 learners in Grade 7, 35 in Grade 8, 42 learners in Grade 9, and 27 learners in Grade 10. A standardized question based on DO 14, S. was used in this study. 2018 – Policy Guidelines for the PHIL-IRI Administration (signed by Briones, 2018).

English teachers for each grade levels provided assistance by providing the data for ORV Test results, as this was also used for their ORV reports. Furthermore, the respondents' mathematical competence was determined with the use of the average grade from first and second quarter in Mathematics. A letter was sent to the San Remigio District II - Cebu Province Division Schools District Supervisor, requesting permission to perform the study, and then to the School Head of Busogon Integrated School (see Appendix A). The researcher obtained authorization to conduct the study from school principal and the district office, and the respondents completed an assent form through their parents (see Appendix B). On the scheduled distribution and retrieval of modules, parents were asked about information about their family's income. The parents were notified through email or text message that their information will be utilized for research reasons. The ORV findings were obtained from the English/Language teacher who screened and verified the students. The student's math performance data was gathered by the researcher from the Junior High School Math Teacher of Busogon Integrated School. The answers of the respondents were then gathered and tallied. The data gathered were then interpreted.

III. RESULTS AND DISCUSSION

The collected data was presented in this chapter, and the results were evaluated and interpreted. This study aimed to determine if Reading Proficiency predicts Mathematical Competence of Junior High School Learners of Busogon Integrated School. The data gathered from this study were organized in a table showing the profile of the respondents in terms of age, gender, grade, family income, learner's reading level, learner's Mathematical competence, significant relationship between the profile of the respondents and their reading level, significant relationship between the profile of the respondents and their Mathematical competence, and reading proficiency as predictor of Mathematical competence of the respondents and action plan to be proposed. The significance of the relationship between the respondents' profile and level of reading proficiency; and the significance of the relationship between reading proficiency and Mathematical competence were also shown in the tables presented in this chapter.

Profile of the Respondents

A total of 131 respondents from Junior High Scholl department of Busogon Integrated School of San Remigio District II participated in this study. Table 2 recorded the profile of the respondents in terms of age, gender, grade level and family income.

In terms of age, it showed 55.7% are 11 - 14 years old, 38.9% are 15 - 18 years old, 5.3% are 19 - 24 years old. Thus,

most of the respondents who took part in this study are 11 - 14 years old. Most of the respondents were males comprising 55% of the population while the learner-female participants had a percentage of 45.0%.

TABLE 2. Profile of the Respondents						
Profile Frequency Percenta						
Age						
-	11 - 14	73	55.7			
	15 - 18	51	38.9			
	19 - 24	7	5.3			
Gender						
	Male	72	55.0			
	Female	59	45.0			
Grade Level						
	Grade 7	27	20.6			
	Grade 8	35	26.7			
	Grade 9	42	32.1			
	Grade 10	27	20.6			
Family Income						
•	1,000 - 5,000	102	77.9			
	5,001 - 10,000	20	15.3			
	10,001 - 15,000	3	2.3			
	15,001 - 20,000	0	0.0			
	20,001 - 25,000	2	1.5			
	25,001 - 30,000	4	3.1			

In terms of respondents' grade level, 32.1% of them were from the Grade 9, 26.7% were from Grade 8, 20.6% were from grade 7, and also 20.6% were from grade 10.

With regard to respondent's family income, it was found out that 77.9% of them were from a family with a monthly income ranging from 1,000 to 5,000 pesos. This was followed by families with monthly income of 5,001 to 10,000 with a percentage of 15.3%. Those with a family income ranging 25,001 to 30,000 were the third highest with 3.1%. A family income ranging of 10,001 to 15,000 has 2.3% while respondents whose parents are having an income ranging from 20,001 to 25,000 got the percentage of 1.5%. However, no respondents with a family income are ranging from 15,001 to 20,000.

This implied that majority of the learners in Junior High School of Busogon Integrated School are 11 - 14 years. Majority of the respondents also were males in terms of gender. Most of the respondents whose parents have a combined monthly family income were less than PhP 5,000. For the respondent's grade level, the majority of them were from Grade 9.

Reading Proficiency Level of the Respondents

Table 3 shows the respondents' reading proficiency in English, this is based on the ratings from ORV (Oral Verification) Test.

	Frequency	Percentage	
TABLE	3. Respondent	s' Reading Pro	ficiencv

	- requerey	- er comunge		
Q1	35	26.72	3	
Q2	38	29.01	2	
Q3	46	35.11	1	
Q4	12	9.16	4	

Legend: Q1 - Reads Fluently with Comprehension / Excellent Reader, Excellent Comprehension; Q2 - Reads Haltingly with Comprehension / Slow Reader, Good Comprehension; Q3 - Reads Fluently with Little or No

Comprehension / Fast Reader, Slow Comprehension; Q4 - Reads Haltingly with Little or No Comprehension / Slow Reader, Poor Comprehension

Most of the learner respondents were under Quadrant 3 (Q3) with a percentage of 35.11. There were 29.01% of the learner respondents who were at Quadrant 2 (Q2), and 26.72% of the pupil respondents were found to be at the Quadrant 1 (Q1) level. Among the learner respondents, 9.16% of the learner respondents were at Quadrant 4 (Q4). Based on the data gathered from the records of the guidance office for the fast 2 consecutive years (face to face learning delivery), it was also found out that the reading proficiency of the learners was still under Quadrant 2. For School year 2019-2020, there were 59 learners out of 143 under quadrant 3 (Reads fluently w/ little or No Comp / Fast Reader, Slow Comprehension) with the percentage of 41.26% of the Junior High School population.

Mathematical Competence Level of the Respondents

Table 4 showed the learners' Mathematical Competence exhibited by the average academic grade in Mathematics for first and second quarter.

TABLE 4. Respondents' Mathematical Competence Level					
Grades	Frequency	Verbal Interpretation	Rank		
Below 75	0	Did Not Meet Expectations	5		
75 - 79	22	Fairly Satisfactory	3		
80 - 84	67	Satisfactory	1		
85 - 89	39	Very Satisfactory	2		
90 - 100	3	Outstanding	4		

It was found out that 67 of them were having a grade ranging from 80 to 84. This was followed by 39 learners having a grade of 85 to 89. Those who have grades ranging 75 to 79 were the third in rank with 22 learners, and 3 learners having a grade ranging from 90 to 100. There were no learners who got the grades of below 75. The results also supported PISA 2018 Report (National Report of the Philippines), the majority of Filipino learners (80.70 percent) have proficiency levels below Level 2, with 54.4 percent having proficiency levels below Level 1. Only one in five learners (19.7%) in the Philippines achieved Proficiency Levels 2 to 4. To solve problems involving whole numbers, these pupils can use simple algorithms, equations, procedures, or conventions. These results showed an average level of Mathematical competence.

The grading system was based on Deped Order 31, s. 2020 - Interim guidelines for assessment and grading in light of the basic education learning continuity plan. And as stipulated on the DepEd Order No. 8, s. 2015 also known as "Policy Guidelines on Classroom Assessment for the K-12 Basic Education Program" and the DepEd Order No. 36, s. 2016 also known as "Policy Guidelines on Awards and Recogniton for the K to 12 Basic Education Program" that those students who have attained an average of 90 to 94 belonged to With Honors, 95 to 97 belonged to With High Honors and the students who can attain with the grade of 98 to 100 is considered as With Highest Honors.



Respondents' Profile and Their Level of Reading Proficiency

In determining the significance of the relationship between the respondents' profile and the level of parental involvement, chi-square was used. Table 5 showed the relationship between the respondents' profile and their level of reading proficiency. The basis of the reading proficiency result is the rating in ORV Test which is gathered from the population of the Junior High School learners in Busogon Integrated School.

This reveals that all of the variables in the student's profile have significant relationship with their level of reading proficiency, except for gender with (P-value = 0.090). Results show that all p-value, except for gender are less than the alpha level ($\alpha = 0.05$) which means that there is significant relationship between the respondent's profile (i.e. age, grade level, and family income, except for gender) and their reading proficiency. Thus, it rejects the null hypothesis.

TABLE 5. Relationship Between the Respondents' Profile and Their Level of Reading Proficiency

Variables	P-value	Decision on H _O (α = 0.05)	Interpretation	Strength of Significance
Age and Reading Proficiency	0.022	Reject H _o	Significant Relationship	0.204 (weak)
Gender and Reading Proficiency	0.090	Failed to Reject H_o	No Significant Relationship	-
Grade Level and Reading Proficiency	0.001	Reject H _o	Significant Relationship	0.269 (weak)
Family Income and Reading Proficiency	0.006	Reject H _o	Significant Relationship	0.333 (weak)

The results between the respondents' profile in terms of gender and reading comprehension show no significant relationship at all with p-value of 0.090. This suggests that, in the case of the respondents to this study, gender has no bearing on the learners' reading skill. It also means that gender has no relevance on the level of reading ability.

There was a significant relationship between age and reading proficiency as shown by the p-value of 0.022. This means that age of the respondents on their reading proficiency are statistically the same. And using the Eta coefficient test, the strength of association between age and reading proficiency is 0.204 which means there is a weak association between the variables. With the results, it implies that somehow age impacted reading level of the learners. Thus, in designing and implementing reading programs and interventions, the age of the learner must be taken into account.

There was a significant relationship between grade level and reading proficiency as shown by the p-value of 0.001, with 0.269 (weak) as strength of significance. This means that grade level of the respondents affects their reading proficiency. Also, using the Eta coefficient test, the strength of association between grade level and reading proficiency is 0.269 which means there is a weak association between the variables. This showed that each grade level has different reading level that needs to be considered in assessing their needs for interventions.

Furthermore, result showed that there was a significant relationship between family income and reading proficiency as shown by the p-value of 0.006. This means that parent's financial challenges have an impact towards learner's reading proficiency. In addition, using the Eta coefficient test, the strength of association between family income and reading proficiency was 0.333 which means a weak association between the variables. As a result, the relationship between socioeconomic status and literacy skills must be considered. Understanding learners' needs outside of the classroom and providing support can help them enhance their reading performance. School should also create programs that would assist learners who belong to family with low income and help improve their reading ability.

Respondents' Profile and Their Mathematical Competence

Table 6 revealed the relationship between the respondent's profile and their mathematical competence. This showed variables age and family income failed to reject the null hypothesis, while variables gender and grade level rejects the null hypothesis with strength of significance – weak.

TABLE 6. Relationship Between the Respondents' Profile and The	eir
Mathematical Competence	

Variables	P-value	Decision on H_0 ($\alpha = 0.05$)	Interpretation	Strength of Significance
Age and Mathematical Competence	0.279	Failed to Reject H_0	No Significant Relationship	-
Gender and Mathematical Competence	0.002	Reject H _o	Significant Relationship	0.299 (weak)
Grade Level and Mathematical Competence	0.001	Reject H _o	Significant Relationship	0.35 (weak)
Family Income and Mathematical Competence	0.178	Failed to Reject Ho	No Significant Relationship	-

Results showed that there was no significant relationship between age and mathematical competence (p-value = 0.279). This means that the age of the respondents statistically does not differ with their mathematical achievement and excellence. This shows that, in the case of the study's participants, age has no influence on their mathematical achievement. It also implies that gender has no impact on one's mathematical aptitude.

As indicated by the p-value of 0.178, the results revealed no significant association between family income and mathematical competence. This suggests that regardless of the aggregate household income of the parents, students can excel in mathematics. This means that students with parents earning a wide range of combined family income perform similarly in mathematics. In some studies, parental income did not seem to contribute to student achievement, it can be assumed that students' failure to achieve academically may be explained by other factors. The wealth of a family or the skin color of a



child should have no impact on how well that child learns (Ford, 2013).

However, result showed a significant relationship between gender and mathematical competence with p-value 0.002. This means gender of the learners affects Mathematical performance. Furthermore, using the Eta coefficient test, the strength of association between gender and mathematical competence was 0.299 which means a weak association between the variables. This showed that males and females were somehow having different learning styles in learning mathematics which greatly affects their mathematical competence. Math teachers should also consider this in crafting varied activities to aid the gap.

Lastly, results revealed that there was a significant relationship between grade level and mathematical competence with p-value 0.001. This showed that grade level of the learner's matters in their achievements in mathematics. In addition, using the Eta coefficient test, the strength of significance between strand and mathematical competence was 0.35 which means a weak association between the variables.

Tables 5 and 6 demonstrated that the learner's profile indeed have a substantial impact on their reading proficiency and mathematical competence during the COVID 19 distance learning mode of delivery of learning, while using the new grading system and considering the school year's continuity plan.

Respondents' Level of Reading Proficiency as Predictor to their Mathematical Competence

The influence of learners' reading competency on their mathematical competency was investigated using a linear regression on the data (N = 131). The *R* value was 0.515, which indicated a medium degree of correlation. In this result, the R Square (.266) indicated that 26.6 % of the variance in learner's achievement Mathematics was explained by the predictive variable ORV Test (Reading Proficiency).

TABLE 7. Model Summary ^b							
Model R R Adjusted R Std. Error of the							
Model	R	Square	Square	Estimate			
1	.515 ^a	.266	.260	2.93259			
a. Predictors: (Constant), ORV Score; b. Dependent Variable: Math Grade							

The first table of interest is the Model Summary table, as shown below. The R value is 0.515, which indicate a medium degree of correlation. In this result, the R Square (.266) indicates that 26.6 % of the variance in learner's achievement Mathematics is explained by the predictive variable ORV Test (Reading Proficiency). This showed that reading comprehension predicts mathematical competence of the learners based on the data in their ORV test results and math grades.

The next table is the ANOVA table, which showed reports on how well the regression fits the data Math grade and ORV Test Score.

	TABLE 8. ANOVA ^a Results							
	Model	Sum of Squares	df	Mean Square	F	Sig.		
	Regression	401.123	1	401.123	46.642	.000 ^b		
1	Residual	1109.412	129	8.600				
	Total	1510.534	130					
	B 1 11		1 0	11 (6				

a. Dependent Variable: mathGrade; b. Predictors: (Constant), ORVscore

This table indicated that the regression model predicts the dependent variable significantly well. This indicated the statistical significance of the regression model that was run. Here, p<0.0005, which was less than 0.05, and indicated that, overall, the regression model statistically significantly predicts the outcome variable. This regression model implied that dependent variable and Predictor variable was correlated to each other and the ORV (reading comprehension) predict math performance (math grades) of the respondents.

The analysis revealed that reading comprehension has a significant positive relationship with Mathematics Competence ($B=0.014 < Sig \ 0.0005$). ORV Score (Reading Comprehension accounts for 26.6% of the variance in Math Grade (Math Competence), F(130)-46.642, p<0.0005.

The Coefficients table determined whether ORV (Oral Verification Test) Score contributes statistically significantly to the model.

	TABLE 9. Coefficients ^a								
	Model	Unstand Coeffi		Standardized Coefficients	f	Sig.	Collinea Statisti		
	Model	В	Std. Error	Beta	ι	51g.	Tolerance	VIF	
1	(Constant)	72.267	1.546		46.743	.000			
1	ORVscore	.142	.021	.515	6.829	.000	1.000	1.000	
a	a Dependent Variable: mathGrade								

a. Dependent Variable: mathGrade

Math Grade = 72.267 + 0.142(ORV Score)

Examination of the regression coefficient reveals that: learners' level of reading proficiency has significant impact on learner's mathematical achievement (B = .142, t = -6.829, p = .000). Based on the result, the more they excel in reading the higher achievement they can have in Math. It also suggests that reading comprehension has a good or negative impact on math class performance. Thus, strengthening and or redesigning existing programs and interventions for reading skill can help improve mathematical confidence of the learners.

This supports other studies, conducted by Henry, Nistor & Baltes, 2014 that examined the relationship between English proficiency and mathematics scores. This study found that English competence predicted ELLs' mathematics scores and that grade level mitigated the influence of English proficiency in predicting those mathematics scores using multiple linear regression analyses. The study backs up the idea that ELL learners who can read well score better on math tests than those who can't. To avoid incorrect diagnoses of ELLs' proficiency levels and abilities, teachers must understand the differences between BICS and CALP. Targeting areas of deficiency with positive instruction could improve student understandable input (Tirol, 2021), which is so important for ELLs to acquire the English fluency needed for academic achievement.



Summary of Findings

The aim of this study intended to see if a learner's reading ability might predict their mathematics ability among Junior High School learners at Busogon Integrated School in San Remigio District II, Cebu Province, for the School Year 2020– 2021. The association between the respondent's profile and their reading ability, the respondent's profile and their mathematical competence, and the relationship between the respondent's reading proficiency and their mathematical competence are all determined by this study.

The results showed that no significant relationship between the respondents' profile in terms of gender towards reading proficiency. However, there was a significant relationship between the respondents' reading comprehension towards their age, grade level, and family income which means that the three variables had average association with each other. As to the respondents' profile and mathematical achievement, there was no significant relationship between the respondents' profile in terms of age and mathematical competence, family income and mathematical competence which implied that the results failed to reject the null hypothesis, which means that age and family income did not affect the mathematical competence of the respondents. Regarding respondents' profile in terms of gender and grade level to their mathematical competence it was revealed that there was a significant relationship with the two variables and the results rejects the hypothesis. This means that learner performance in Mathematics has a correlation with the learner's gender and grade level.

This also supports the study of (Truckenmiller, 2016) predicting math outcomes from a reading screening assessment in grades 3–8. The findings suggest that not only reading and language arts teachers, but also math teachers, should consider students' ability in various reading component skills (such as text comprehension, sentence comprehension, vocabulary, and word recognition) in order to understand how to best help students achieve important outcomes. Schools may be able to improve overall instruction by providing actionable information to both reading and math teachers, as well as incorporating literacy into math.

Finally, the analysis revealed that reading comprehension has a significant positive relationship with Mathematical Competence and identified as predictor of Math achievements. It also identified that an increase in learner's reading level score will result to an increase in the mathematical achievements of the learners. In this, learner's reading proficiency predicts Mathematical competence.

IV. CONCLUSION

It is concluded that learners' level of reading proficiency has significant impact on learner's mathematical competence. Though some may vary, in terms of the learner's profile, the results vary from one variable to another. Getting the relationship between the respondents' reading level to their math achievement, it can be concluded that enhancing learner's reading skill has an impact towards learners' academic excellence in Mathematics. Moreover, it is concluded that the school, language teachers and parents were vital in leaner's achievements. They need to work hand in hand with coordination for achieve excellent learning delivery. Also, the school need to focus in the proper implementation of DepEd's initiated programs focusing on reading which truly help learners to cope up with their challenges in learning the mathematical concepts and other academic courses. Yet, the results from the Oral Reading Verification Test show that most of the learners were instructional readers which were below the expected skills of the learners in this 21st century, learners are expected to be able to read independently for them to be competent enough in working with other studies academically.

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