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THE INDEX CARD MATCH LEARNING MODEL AND KIPIN SCHOOL 4.0 APPLICATION: ENHANCING STUDENT LEARNING OUTCOMES IN NERVOUS SYSTEM MATERIALS

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ABSTRACT

This study discusses the effectiveness of the Index Card Match learning model assisted by the Kipin School 4.0 application on student learning outcomes on nervous system material for class XI MAN Gowa. This study used a non-equivalent (pretest-posttest) control group design in a quasi-experimental setting. The sample in this study consisted of 60 students from two classes, namely class XI IPA 2 as the experimental class and class XI IPA 1 as the control class, which were selected using a purposive sampling technique. The instruments used were learning achievement tests, observation sheets, and documentation sheets. The data analysis techniques used were descriptive and inferential analysis using prerequisite tests, independent sample t-tests, and independent sample effect size tests. Based on the results, the student learning outcomes in the experimental class fell into the very effective category with an average number of 89.36. Those in the control class met the effective category with an average number of 64.76. The results of the inferential analysis of data on the independent sample t-test showed that the significance value obtained was t count 0.000 < 0.05. This leads to the conclusion that there is a significant difference between the experimental and control classes' learning outcomes. On the independent sample effect size test, the effect size was 2.815, which is in the high category, with an increase in learning outcomes of 97.7%. In conclusion, the results indicate that implementing the Index Card Match learning model, with the support of the Kipin School 4.0 application, is highly effective in enhancing student learning outcomes in Class XI Nervous System Material at MAN Gowa.

Keywords: Learning outcomes; index card match; Kipin school 4.0 application

1. INTRODUCTION

Education is a planned process of teaching each individual to become responsible, have a creative spirit, be knowledgeable, independent, and have noble character (Inanna, 2018). The law on the national education system article 1 no.20 of 2003 states that education is a planned effort aimed at creating an active learning process for students and increasing spiritual values in religion, being able to control oneself, morals, intelligence, and all that is needed by oneself, the surrounding community, the nation and the country (Khairi, 2020). Education is not only focused on teaching, but is also related to imparting knowledge, changing values, and developing personality in all respects (Nurkholis, 2013).

Whether we realize it or not, humans will continue to carry out learning activities. Learning can be interpreted as a change in view or understanding of (Gasong, 2021). Learning is essentially a process, namely a process that can encourage students to continue learning by managing or organizing the environment around them. Every student in the learning process has different responses, there are students who quickly digest material and there are those who need much more time to understand the same material. These two things can be used as a reference by the teacher to find the right solution in the learning process. Therefore, teachers must find learning strategies that are suitable for each student (Pane and Muhammad, 2017).

Using a learning model is one of the learning strategies that can be used by teachers. Susan Ellis stated that the learning model is a strategy carried out in the learning process by teachers and students whose implementation is based on steps, theories, and research (Sundari, 2015). While Joyce and Weil, stated that learning models can be used as a reference for forming curricula and references for making learning equipment, so teachers can determine which models are effective for educational purposes (Khoerunnisa and Syifa, 2020).

As a result of an interview on November 23, 2022, with a teacher in Class XI biology at MAN Gowa, information was obtained that students had difficulty understanding biology material, especially the nervous system. It is known that this material contains many concepts related to the central nervous system (brain and spinal cord) and the peripheral nervous system (somatic nervous system and autonomic nervous system). The results of teacher interviews also revealed that students were less able to remember or reflect on previous learning. What is experienced by students can lead to learning outcomes, especially material on the low nervous system. This is shown by the achievement of KKM scores in class XI which is still low, namely only 50% of students are able to achieve KKM (70). Therefore, we need a learning model that can help us understand the material of the nervous system. This condition is also influenced

by the limited availability of references. Teachers and students expect the material to be studied should use various references. The results of observations on biology learning use a textbook as the main reference, there is still a need for additional references that can support the learning process.

Index Card Match is a learning model. This learning model is done by matching question cards with answers, this learning model can be used to solve learning problems. This learning model refers to how to remember what has been learned while studying concepts while looking for pairs of cards related to answers or questions in a fun atmosphere (Mustikasari, 2014). Matching paired cards can increase cooperation in answering questions. Collaboration that is established between students can activate learning to understand the concepts that have been learned (Putri and Feri, 2022).

Application is one of the learning resources that can be used, but in fact, its use in the learning process is still minimal. Juraman in his research concluded that using the application would be very useful for learning and quite effective in accessing educational information, receiving and understanding subjects on the one hand, and on the other hand it also made it easier for teachers to present subjects (Mulyani, 2018). Kipin School 4.0 is an educational application that can be downloaded for free via Android phones, tablets, and iPhone Operating System (IOS), and can be downloaded via a laptop or personal computer (PC). This application consists of thousands of online textbooks with various levels ranging from elementary to high school level and equivalent. The books in this application are published directly by the Ministry of Education and Culture in accordance with the latest curriculum program implemented by Indonesia (Putra et al, 2015).

Research that is relevant to the research that will be carried out is research conducted by Indah Puspa Sari, in 2019 with the title The Effect of Index Card Match Active Learning Models on Student Learning Understanding in Economics Subjects at State High School 9 Pekanbaru. The results of this study indicate that: There is an influence on the understanding of student learning at Public Senior High School 9 Pekanbaru in the subject of Economics by using the Index Card Match active learning model. This is consistent with the post-test scores of the two classes where the average of 14.7714 was obtained from the experimental class which was greater than the average value in the control class of 12.1429 with the acquisition of a t-test value of 5.493 and 0.0 in the significance value smaller than the probability value of 0.05.

The research conducted by Ummiyati et al in 2022 entitled The Effect of the Reading Questioning and Answering (RQA) Learning Model Assisted by the Kipin School Application on Cognitive Learning Outcomes of Class VII Students of SMP Negeri 3 Kota Ternate. The results of this study indicate that: The use of the Reading Questioning and

Answering learning model assisted by the Kipin School application has an influence on cognitive learning outcomes with a significant score of 0.001 <0.05.

These studies have similarities with the research that will be examined by researchers, where research conducted by Indah Puspa Sari uses the Index Card Match learning model using a quasi-experimental research type. Meanwhile, the research conducted by Ummiyati et al used the Reading Questioning and Answering (RQA) Learning Model Assisted by the Kipin School Application. Whereas in this study the researchers focused on the effectiveness of the Index Card Match learning model assisted by the Kipin School 4.0 application on student learning outcomes on nervous system material for class XI at MAN Gowa. The difference between this study and previous research is the use of the Index Card Match learning model assisted by the Kipin School 4.0 application on student learning outcomes that have never been studied by previous researchers, as well as the use of research methods, types and research samples. So that the formulation of the problem in this study is: 1) How are the learning outcomes of class XI students at MAN Gowa on the nervous system material taught by the Index Card Match learning model assisted by the Kipin School 4.0 application? 2) What are the learning outcomes of class XI students at MAN Gowa on the subject of the nervous system taught by the Direct Instruction learning model? 3) Is the use of the Index Card Match learning model assisted by the Kipin School 4.0 application effective for student learning outcomes in class XI nervous system material at MAN Gowa?

2. METHODS

This research uses a quantitative approach, which is a type of research using numbers as a tool to analyze what you want to know (Djollong, 2014). This research uses quasi-experimental research (Quasi Experiment), one class becomes the experimental class and another class becomes the comparison or control class (Sugiyono, 2019). This research was conducted at MAN Gowa, the academic year 2022/2023. The time for this research is in the even semester, 13 to 21 March 2023. The research design used is a Nonequivalent (Pretest-Posttest) Control Group Design. as presented in Table 1.

Table 1. Research Design

Class	Pretest	Treatment	Post-test
E(R)	O_1	X	O_2
K(R)	O_3	-	O_4

Note:

E : Experimental class

K : Control class

X : Learning using the *Index Card Match learning model with the help of the Kipin School 4.0* application

\- : Learning by using the *Direct Instruction learning model*

O_1 : *Pretest* learning outcomes in the experimental class

O_2 : *Posttest* student learning outcomes in the experimental class

O_3 : *Pretest* student learning outcomes in the control class

O4 : *Posttest of* student learning outcomes in the control class

Sources of data in this study are divided into two, namely primary data and secondary data. Primary data is data collected directly by researchers from the first source called primary data. The primary data in this study are student learning outcomes obtained from the pretest and post-test questions. Secondary data is data obtained from a second source referred to as secondary data. This data is used by non-processors (Siregar, 2019). Secondary data used in this study were obtained from schools or school documents h.

The population in this study were all students of class XI MAN Gowa. Sampling using purposive sampling technique, namely class XI IPA 2 which became the experimental class which was treated using the *Index Card Match learning model assisted by the Kipin School 4.0* application, and class XI IPA 1 which is the control class with conventional learning, namely the *Direct Instruction learning model.*

The instruments in this study were observation sheets, learning achievement tests and documentation sheets. Instruments are used to obtain information in solving research problems, instruments are used (Sudaryono, 2017). The observation sheet consists of observation sheets of teacher activities that aim to find out how well the learning carried out by the teacher uses the Index Card Match learning model assisted by the Kipin School 4.0 application during learning. The student activity observation sheet aims to monitor student activity in the learning process using the Index Card Match learning model assisted by the Kipin School 4.0 application in biology subjects on the ongoing nervous system material. The test is a tool to find out students' abilities after receiving the subject matter (Ismail, 2020). The learning outcomes test in this study was used to determine students' abilities. The tests in this study were carried out twice, namely before the treatment (pretest) and after the treatment (post-test) in both the experimental class and the control class. The type of test used was a written test in the form of multiple choice questions on the nervous system material. The documentation contains descriptions taken by researchers to strengthen research results. Documentation is used as a source of data in research to test, interpret, as well as for predictions (Anggito and Setiawan, 2018). Documentation sheets in this study were taken for use in archiving the number of student populations and archiving photos of

researchers in conducting research. This documentation is used as research evidence on the Effectiveness of the Index Card Match Learning Model Assisted by the Kipin School 4.0 application on Nervous System Materials for class XI at MAN Gowa.

This instrument was prepared by the researcher and will then be validated by 2 validators using the content validity test according to Aiken's V as follows:

$$V = \frac{\sum s}{n\,(c-1)}$$

Note:

V : index of expert agreement regarding item validity

s : (s = r – lo, where r = lowest score in scoring and lo = lowest score)

n : many experts

c : the number of categories that experts can choose from

This study used two data analysis techniques, namely descriptive statistical analysis and inferential statistical analysis techniques. Descriptive statistical analysis was used to measure the average value of student learning outcomes and inferential statistical analysis was used to analyze research data through prerequisite tests, independent sample t-tests, and independent samples effect.

3. RESULTS AND DISCUSSION

Based on the results of research that has been conducted at MAN Gowa class XI IPA 2 as an experimental class, namely taught using the Index Card Match learning model assisted by the Kipin School 4.0 application, data is obtained from the instrument in the form of a learning achievement test which is given twice to students, namely the pretest given before the treatment and the post-test after being given treatment.

The results of descriptive statistical analysis on student learning outcomes in the experimental class after the pretest and post-test were carried out as shown in table 2 below:

Table 2. Pretest and Post-test Analysis of Experimental Classes

Parameter	Pretest Value	Post-test Value
Maximum Value	48	96
Min Value	16	76
Average	30, 83	8 9,36
Standard Deviation	7,52	6,28
Variance	56, 34	3 9.53

Based on the results of the descriptive analysis in Table 2 above, it can be seen that in the pretest the average score obtained by students is 30.83 with a maximum score of 48, a minimum score of 16, a standard deviation of 7.52 with a variance of 56.34. Whereas in the post-test the average score obtained by students is 8 9.36 with a maximum value of 96, the minimum value is 76, and the standard deviation is 6.28 with a variance of 3 9.53.

We can see the pretest and post-test learning outcomes of experimental class students in Table 3 regarding academic proficiency criteria:

Table 3. Academic Proficiency Assessment Criteria

Mastery Presentation	Pretest Frequency	Post-test Frequency	Category	Presentation
>80	0	22	Very effective	73.33%
>60–80	0	8	Effective	26.66%
>40–60	2	0	Enough	6.66%
>20–40	25	0	Not enough	83.33%
≤20	3	0	Very less	10%

Based on Table 3 above, it can be obtained the distribution of the experimental class students' pretest scores based on the frequency distribution category. There are 2 people in the sufficient category, 25 people in the less category, and 3 people in the very less category. While the distribution of students' post-test scores was 22 people in the very effective category and 8 people in the effective category.

Based on the results of research that has been conducted at MAN Gowa class XI IPA 1 as a control class that is taught with the Direct Instruction learning model, data is obtained from the instrument in the form of a learning achievement test which is given twice to students, namely pretest given before treatment and post-test after being given treatment.

The results of the descriptive statistical analysis on the learning outcomes of the control class students after the pretest and post-test were carried out as shown in Table 4 below:

Table 4. Pretest and Post-test Analysis of Control Class

Parameter	Pretest Value	Post-test Value
Maximum Value	40	80
Min Value	16	48
Average	30,26	64,76
Standard Deviation	5,36	9,48
Variance	28.79	89.97

Based on the results of the descriptive analysis in Table 4 above, it can be seen that in the pretest the average score obtained by students is 30.26 with a maximum score of 40, a minimum score of 16, a standard deviation of 5.36 with a variance of 28.79. Whereas in the post-test the average score obtained by students is 6 4.76 with a maximum value of 80, the minimum value is 48, and the standard deviation is 9.48 with a variance of 8 9.97.

We can see the pretest and post-test learning outcomes of control class students in Table 5 about academic proficiency criteria:

Table 5. Academic Proficiency Assessment Criteria

Mastery Presentation	Pretest Frequency	Post-test Frequency	Category	Presentation
>80	0	0	Very effective	0%
>60–80	0	19	Effective	63.33%
>40–60	0	11	Enough	36.66%
>20–40	28	0	Not enough	93.33%
≤20	2	0	Very less	6.66%

Based on Table 5 above, it can be obtained the distribution of pretest scores of control class students based on the frequency distribution category. There are 28 people in the less category and 2 people in the very less category. While the distribution of students' post-test scores was 19 people in the effective category and 11 people in the sufficient category.

Inferential statistical analysis was used to analyze research data through prerequisite tests (normality test and homogeneity test), *independent sample t-test, and independent samples effect size* test.

The normality test was carried out to find out whether the data obtained from student learning outcomes were normally distributed both in the control class, namely class XI IPA 1, and in the experimental class, namely class XI IPA 2. Decision-making on the normality test was seen from the sign. If sign > α it can be concluded that the data is normally distributed and if the sign < α then the data is not normally distributed. The results of the normality test in this study can be seen in Table 6 below:

Table 6. Results of the Normality Test for Learning Outcomes

	Kosmogorov Smirnov			
Class	**Statistics**	**Df**	**sign**	**Information**
Experiment Pretest	0.138	30	0.147	Normal Distribution
Posttest Experiment	0.145	30	0.110	
Pretest Control	0.143	30	0.120	
Posttest Control	0.141	30	0.133	

Based on the data in Table 6, the results of the normality test above used the Kolmogorov Smirnov test using the Stasistical Product and Service Solution (SPSS version 27) software program on the experimental class data (XI IPA 2) which was taught using the Index Card Match learning model assisted by the Kipin application School 4.0 in the pretest obtained a sign value of 0.1 47 and in the post-test obtained a sign value of 0.110, this shows that the sign value > α, where the value of α is 0.05 so it can be concluded that the data from the learning outcomes of the experimental class are normally distributed. As for the learning outcomes data for the control class (XI IPA 1) which was taught using the Direct Instruction learning model, it obtained a sign value of in the pretest of 0.120 and in the post-test a sign value of 0.133, this indicates that the sign value > α, where is the value of α is 0.05 so it can be concluded that the learning outcomes data from the control class is normally distributed. So, the data from the Experiment class (XI IPA 2) and the control class (XI IPA 1) are normally distributed.

A homogeneity test is carried out to show whether the data from the samples that have been obtained come from populations that have the same variation, in other words, the data sets have the same characteristics or vice versa. The criteria for taking the homogeneity test are if the sign value > α then the population data has a homogeneous variance and if the value is sign < α then the population data has an inhomogeneous variance. The results of the homogeneity test can be seen in Table 7 below:

Table 7. Results of Experimental and Control Class Homogeneity Tests

Levene Statistics	Dfl	Df2	sign	Information
1.715	1	58	0.195	Homogeneous

Based on the results of the homogeneity test analysis using the Statistical Product and Service Solution (SPSS version 27) software program, a sign value of 0.195 was obtained while the α value was 0.05, so the sign value > α. This means that both groups come from homogeneous populations.

Hypothesis testing was carried out to find out whether the use of the Index Card Match learning model assisted by the Kipin School 4.0 application was effective on student learning outcomes based on the average value of their learning outcomes. Hypothesis testing in this study used the t-test (independent sample t-test) and Cohend's d-effect size.

The results of the independent sample t-test can be seen in Table 8 below:

Table 8. Independent Sample T-test Results

	Levene's Test for Equity Of variances		t-test for Equity of Means		
	F	sign	Q	Df	sign (2tailed)
Equal variances assumed	8,538	0.005	10,902	58	0.000
Equal variances non assumed			10,902	47,885	0.000

A study is said to have a proven hypothesis if the significance value is less than 0.05 (sign <0.05), where H 0 is rejected and H 1 is accepted. Based on Table 8 above. it can be seen that the significant value in the hypothesis test using the Statistical Product and Service Solution (SPSS version 27) software program, obtained a sign value (2-tailed) = 0.000. So that the hypothesis in this study can be said to be proven because 0.000 <0.05 or by looking at a t count of 10.902 while a t table of 2.021 thus t count > t table. This means that there is a significant difference between the learning outcomes of students who are taught with the Index Card Match learning model assisted by the Kipin School 4.0 application and students who are taught using the Direct Instruction learning model.

The independent sample effect size test can be seen in Table 9 below:

Table 9. Independent Sample Effect Size Test Results

		Standardizer	Point Estimates
Learning outcomes	**Cohen's d**	7,626	2,815
	Hedges' correction	7,727	2,778
	Glass's delta	9,214	2,330

Based on Table 9 above, it can be seen that the results of the independent sample's effect size using Cohen's d resulted in an effect size of 2.815. Based on the table of Cohen's d interpretation criteria, the effect size > 2.0 is in the high category with a percentage of 97.7%. This means that using the Index Card Match learning model assisted by the Kipin School 4.0 application will increase learning outcomes by 97.7%. This shows that the use of the Index Card Match learning model assisted by the Kipin School 4.0 application is effective for Student Learning Outcomes in Class XI Nervous System Material at MAN Gowa.

This study measures student learning outcomes in the experimental class and control class. The experimental class is class XI IPA 2 which is taught using the Index Card Match learning model assisted by the Kipin School 4.0 application, while the control class is class XI Science 1 which is taught using the Direct Instruction learning model.

The learning outcomes of students who are taught using the Index Card Match learning model assisted by the Kipin School 4.0 application refer to the academic proficiency assessment criteria. Based on this category, there were 22 students in the very good category with a presentation of 73% and there were 8 students in the good category with a percentage of 27%. As well as an average value of 89.36 which is in the very good category. Based on these data it can be concluded that the learning outcomes of students taught using the Index Card Match learning model assisted by the Kipin School 4.0 application are in the very good category.

Student learning outcomes have increased because learning using the Index Card Match learning model assisted by the Kipin School 4.0 application encourages all students to be active in learning. This can be seen from the student activity sheets and direct observations by researchers, where students are seen paying attention to the guidelines and directions for the steps of the Index Card Match learning model assisted by the Kipin School 4.0 application. In addition, the enthusiasm of the students was also evident during the learning process using the Index Card Match learning model assisted by the Kipin School 4.0 application. This is in line with Siberman who stated that with the help of the Index Card Match learning model, the learning process can be more enjoyable by reviewing previously learned material. This learning model refers to how to remember what has been learned while studying concepts while looking for pairs of

cards related to answers or questions in a fun atmosphere (Mustikasari et al, 2014). In line with that Anggilia and Feri states that matching paired cards can increase cooperation in answering questions. Collaboration that is established between students can activate learning to understand the concepts that have been studied so that student learning outcomes can increase (Putri and Feri, 2022). In addition, with the help of the Kipin School 4.0 application, the Index Card Match learning model is very useful for students in understanding the concepts being studied. This is in line with Juraman which states that using the application will be very useful for learning and is quite effective in accessing educational information, receiving and understanding subjects on the one hand, and on the other hand it also makes it easier for teachers to present subjects (Mulyani, 2018).

The learning outcomes of students who are taught using the Direct Instruction learning model refer to the academic proficiency assessment criteria. Based on these categories, there are 19 students in the good category with a presentation of 63% and there are 11 students in the adequate category with a percentage of 37%. As well as an average value of 64.76 which is in the good category. Based on these data, in general, it can be said that the achievement of student learning outcomes in the control class has increased when compared to the results of the pretest carried out, however, this increase has not yet reached the Minimum Completeness Criteria (KKM) value of 75.

Student learning outcomes obtained in the control class indicate that learning is good but not optimal. This can happen because of the use of the Direct Instruction learning model where the teacher only explains the material in the biology textbook to students which results in students not understanding the concepts being studied. According to Susan Ellis, the selection of learning models can be useful for teachers and students in the learning process (Sundari, 2015). In addition, learning resources that are not used properly can affect learning outcomes. Application is one of the learning resources that can be used, but in fact, its use in the learning process is still minimal. Juraman stated that using the application would be very useful for learning and quite effective in accessing educational information, receiving and understanding subjects on the one hand, and on the other hand it also made it easier for teachers to present subjects (Mulyani, 2018).

The Index Card Matc learning model assisted by the Kipin School 4.0 application can be seen from the results of the hypothesis test. The hypothesis in this study was used to see the difference in post-test scores for the experimental class (XI IPA 2) and the control class (XI IPA 1). Based on the results of the independent sample t-test analysis, the sign value was obtained. (2-tailed) of 0.000. In addition, the value of t count and t table on the results of the analysis is t count of 10.902 while t table is 2.021 which means t count > t table so it can be concluded that H 0 is rejected and H 1 is accepted.

This means that there is an effect of using the Index Card Match learning model h assisted by the Kipin School 4.0 application on student learning outcomes on nervous system material for class XI at MAN Gowa. Based on the independent samples effect size test using Cohen's d, the result of an effect size of 2.815 is in the high category with an increase in learning outcomes of 97.7%. This shows that the use of the Index Card Match learning model assisted by the Kipin School 4.0 application is effective for Student Learning Outcomes in Class XI Nervous System Material at MAN Gowa. Implementation of learning using the Index Card Match learning model assisted by the Kipin School 4.0 application gets positive responses from students, where students are very enthusiastic and active in learning so that understanding of the material being studied and learning outcomes also increase.

Index Card Match learning model assisted by the Kipin School 4.0 application used in this study raises interest in students. Where when the researcher explained regarding the use of the Index Card Match assisted by the Kipin School 4.0 application, all students were focused and very enthusiastic about paying attention. This is evidenced by the large number of students who asked about the Index Card Match card used and about the features contained in the Kipin School 4.0 application. Siberman stated that by using the Index Card Match learning model students would be active from the beginning of learning to completion. In line with Marsyida, Ariyanti, and Ropi who proved that the use of the Index Card Match learning model can improve students ' biology learning outcomes (Aggun et al, 2018). The learning process with the Index Card Match learning model assisted by the Kipin School 4.0 application which can be accessed easily is very beneficial for improving student learning outcomes. The Kipin School 4.0 application is equipped with thousands of books that can be accessed by students. In line with that Heddy, Shri Ahimsa Putra, et al stated that the Kipin School 4.0 application is an application that is effectively used in learning where this application contains thousands of books published directly by the Ministry of Education and Culture in accordance with the latest curriculum program implemented in Indonesia (Putra et al, 2015).

This study proves that using the Index Card Match learning model assisted by the Kipin School 4.0 application effectively improves student learning outcomes. Students' understanding especially on the material of the nervous system can be achieved. This shows that the Index Card Match learning model assisted by the Kipin School 4.0 application can be used in the learning process.

4. CONCLUSION

The following conclusions are obtained: 1) The learning outcomes of students taught using the Index Card Match learning model assisted by the Kipin School 4.0 application for class XI MAN Gowa obtained an average pretest score of 30.83 in the category less and the post-test average score of 89.36 in the very good category. 2) The

learning outcomes of students who were taught using the Direct Instruction learning model for class XI MAN Gowa obtained an average pretest score of 30.26 in the less category and an average post-test score of 64.76 in the good category. 3) The use of the Index Card Match learning model assisted by the Kipin School 4.0 application is effective for student learning outcomes in class XI nervous system material at MAN Gowa.

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