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The Effect of Fruit Audio Aroma Media on Basic Science Process Skills in Elementary School

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ABSTRAK

Keterampilan proses sains dasar penting bagi peserta didik sekolah dasar. Keterampilan proses sains dasar dapat mengoptimalkan kemampuan berpikir kritis dan kemampuan berpikir ilmiah pada peserta didik. Selain itu, keterampilan proses sains dasar juga dapat melatih peserta didik untuk memecahkan permasalahan-permasalahan yang dialaminya dalam kehidupan sehari-hari. Namun, masih banyak peserta didik sekolah dasar yang belum menguasai keterampilan proses sains dasar tersebut. Maka dari itu, dibutuhkan media pembelajaran untuk mengoptimalkan keterampilan proses sains dasar tersebut. Salah satu media pembelajaran yang dapat digunakan untuk mengotimalkan keterampilan proses sains dasar pada peserta didik sekolah dasar adalah media pembelajaran Fruit Audio Aroma. Tujuan dilakukannya penelitian ini adalah untuk menganalisis ada tidaknya pengaruh dari penggunaan media pembelajaran Fruit Audio Aroma terhadap keterampilan proses sains dasar pada peserta didik sekolah dasar. Penelitian ini merupakan penelitian kuantitatif eksperimen jenis one-shot case study yang dilakukan dengan memberikan treatment pada peserta didik. Teknik pengumpulan data pada penelitian ini dilakukan menggunakan tes performa. Teknik analisis data pada penelitian ini dilakukan menggunakan uji non parametrik melalui uji Wilcoxon. Hasil uji Wilcoxon menunjukkan bahwa penggunaan media pembelajaran Fruit Audio Aroma dapat memberikan pengaruh positif terhadap keterampilan proses sains dasar peserta didik sekolah dasar. Hasil penelitian ini diharapkan mampu memberikan kontribusi sebagai bahan pertimbangan bagi pendidik untuk mengoptimalkan keterampilan proses sains dasar pada peserta didik.

ABSTRACT

Basic science process skills are important for elementary school students. Basic science process skills can optimize students' critical thinking skills and scientific thinking skills. In addition, they can also train students to solve the problems they experience in everyday life. However, many students have not mastered these skills. Therefore, learning media is needed to optimize these basic science process skills. Therefore, it is necessary to create learning media to optimize these basic science process skills. One of the learning media that can be used to optimize the basic science process skills in elementary school students is Fruit Audio Aroma learning media. This study aimed to analyze whether there was an effect of the use of Fruit Audio Aroma learning media on the basic science process skills in elementary school students. This research was a quantitative experimental one-shot case study conducted by providing treatment to students. Data were collected through performance tests. Data analysis techniques were carried out through the non-parametric test through the Wilcoxon test. The results of the Wilcoxon test show that the use of Fruit Audio Aroma learning media affected elementary school students' basic science process skills. The results of this study are expected to contribute to educators' optimization of students' basic science process skills.

1. INTRODUCTION

Science learning is one of the compulsory subjects in elementary schools. Science learning cannot be separated from students' everyday life because science can be used to train students' critical thinking skills, creative thinking, and logical thinking (Putra et al., 2020; Utariasih et al., 2018). Furthermore, students are taught the process of many things when learning science. This learning activity is not only oriented to learning outcomes but also the formation of students' scientific attitudes (Faizah et al., 2020; Widani et al., 2019). The learning outcomes and attitudes are useful for students to recognize natural phenomena around them better. In addition, science learning also emphasizes the development of skills carried out so that students get meaningful learning experiences (Lawe, 2018; Suryani et al., 2019). These science skills are called science process skills. Science process skills are important for students in understanding a scientific concept. Science process skills are skills that are used to investigate a phenomenon whose truth is unknown using the scientific method (Mustafa et al., 2021; Temiz, 2020). These skills can be obtained through training processes and the application of scientific concepts in hands-on practicum activities. Science process skills are divided into two, namely basic science process skills and combined

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science process skills. If the two KPS (Science process skills) are properly trained, they will improve students' cognitive and scientific attitudes (Khotimah & Hastuti, 2021; Tinapay et al., 2021). Science process skills include cognitive aspects (communicating, concluding, measuring, and comparing), psychomotor aspects (observing, classifying, and conducting experiments), and affective aspects in the form of experience, problem-solving, and accuracy (Darmaji et al., 2020; Harahap et al., 2019; Nirmala & Darmawati, 2021). Optimizing science process skills is important because it will affect the way students solve problems. Therefore, teachers should create a learning environment that considers and pays attention to the science process skills.

This study discusses basic science process skills which include observing, making inferences, measuring, comparing, communicating, and classifying. Basic science process skills are parts of the science process skills needed by elementary school students before learning integrated science (Ekici & Erdem, 2020; Senisum, 2021). Students' creative thinking skills can be optimized through this science process skills training. Students also gained meaningful learning experiences (Ernawati et al., 2019; Suryanti et al., 2020). Basic science process skills are important for students because they are directly related to integrated process skills, and these skills can trigger students' critical thinking. Basic science process skills can also be used to stimulate students' scientific thinking abilities. For example, in developing methods and solving certain problems (Dikici et al., 2020; Winarni et al., 2020; Yampap & Bay, 2020). In addition, this skill can also develop students' scientific skills and scientific attitudes, such as curiosity, responsibility, discipline, cooperation, and honesty.

Based on the explanations above, it can be seen that the basic science process skills are important for elementary school students. However, many students have not mastered these skills. The implementation of science process skills in elementary schools is limited only to observing activities. The basic science process skills of third-grade students at SD Negeri 016 Balung are still poor (Darmayanti & Setiawati, 2022; Novita et al., 2019). This is caused by the teacher who does not allow students to practice when learning science. The low level of basic science process skills is also caused by a mismatch in learning methods, learning approaches, and a lack of learning media. Therefore, we need certain learning media to do science practicum so that basic science process skills in elementary school students can change.

Learning media can be interpreted as all learning tools that are integrated into learning resources so that they can be used by teachers to convey learning materials to students. Learning media effective for accelerating students' understanding of the material being taught (Daryanes et al., 2023; Surata et al., 2020). Teachers should use learning media so that learning materials can be conveyed properly and students can develop their skills. Teachers should be able to choose good learning media to benefit from learning media use. Good learning media can encourage student activity in terms of responding to answers and providing feedback and can encourage students to carry out practical skills correctly. Good learning media can be seen clearly by all students, should be prepared based on the subject matter to be taught, arranged according to the learning needs of students, can attract students' interest, and should also be prepared to meet students' different characteristics and certain conditions (Miftah & Rokhman, 2022; Setiawan et al., 2021).

One of the media that influences the basic science process skills in elementary school students is the Fruit Audio Aroma learning media. Fruit Audio Aroma learning media is a three-dimensional fruit-shaped learning media consisting of fifteen types of fruits. The fruits are apple, grape, avocado, star fruit, durian, coconut, orange, soursop, pineapple, banana, lemon, jackfruit, strawberry, melon, and mango. The Fruit Audio Aroma learning media consists of three parts, namely the main part of the media, the media cover, and the media base. The main part of the media displays the shape of certain fruits with a texture like real fruit and has an aroma holder inside. The media cover has small holes that function to release aroma. While the media base displays the name of certain fruits and the audio QR code.

The way Fruit Audio Aroma learning media works is by displaying a three-dimensional shape that can be touched and measured, emitting sounds from the three-language audio on the QR code, and emitting fruit aroma from the small holes in the media lid. The way Fruit Audio Aroma learning media works can allow students to see the media, touch the media, measure the media, listen to audio, and smell the media. So that indirectly students can carry out measurement and observation activities. Measurement and observation activities are part of basic science process skills. The results of observation activities can be used by students to carry out other scientific activities in basic science process skills. For example, to analyze similarities and differences from one fruit to another, classify fruits with certain categories, communicate observations, and make a conclusion. Therefore, the use of fruit audio aroma learning media is expected to optimize basic science process skills in students.

This research was conducted in SD Negeri Karangasem 2. Based on the results of observation, basic science process skills in the third-graders of SD Negeri Karangasem 2 are still poor. This is because the teacher has not used learning media that can support the basic processes of science when learning science. The teacher only uses a module. In addition, the learning method used by the teacher is only the lecture method which is too monotonous and tends to be teacher-centered. Therefore, students are unable to communicate their opinions fluently, draw conclusions, make a comparison, and classify things. Previous research regarding basic science process skills in elementary school students was used the inquiry method to develop basic science process skills

(Lusidawaty et al., 2020). Another research was used the online project-based learning method to optimize students' science process skills (Nurjanah & Cahyana, 2021). The two studies have not used instructional media at all. So the difference between previous research and this research lies in the use of media and learning methods. This research is conducted using Fruit Audio Aroma learning media with practical learning methods.

The novelty of this research is that the process of optimizing students' basic science process skills is carried out using the Fruit Audio Aroma learning media. Fruit Audio Aroma is a fruit-shaped three-dimensional learning media. This media has aromas and textures similar to real fruit, and audio in three languages related to fruit characteristics. This media can influence students' basic science process skills. Because by using the Fruit Audio Aroma learning media, students can make some observations regarding the shapes and colors of fruit, classify fruit based on colors, shapes, textures, and sizes, look for similarities and differences in fruit, convey information related to fruit, measure diameter and height of fruit, communicate the results of observations, and draw conclusions. So, this research aims to analyze whether there is an effect of using Fruit Audio Aroma learning media on students' basic science process skills.

2. METHOD

This research was conducted using a quantitative experimental approach in the form of a one-shot case study. A one-shot case study is a form of experimental research design carried out by giving a special treatment to a group and then observing the results of that treatment (Madadizadeh, 2022). The special treatment carried out is in the form of using Fruit Audio Aroma learning media in the science learning process. Research was conducted at the Public Elementary School of Karangasem 2, so the population in this study was all students of the Public Elementary School of Karangasem 2. While the sample in this study was the third-graders of SD Negeri Karangasem 2. The sample was chosen because based on the results of initial observations that have been made, the basic SPS of these students are still low, so they are in accordance with the problems being studied. The sample was obtained by sampling technique in the form of cluster random sampling. The independent variable in this study was the use of Fruit Audio Aroma media and the dependent variable in this study was students' basic science process skills. The data collection techniques used in this study are performance test. The performance test used consisted of 40 descriptors. The descriptors were obtained by elaborating indicators from six aspects included in basic SPS, namely observing, classifying, comparing, measuring, communicating, and concluding. The data analysis was carried out through the stages of normality testing and hypothesis testing. The data analysis process was carried out with the help of SPSS 26 software. The data normality test was carried out using the Shapiro-Wilk formula. While the hypothesis testing was done by the non parametric test trough Wilcoxon test.

3. RESULT AND DISCUSSION

Result

The research data from this study were obtained from a research sample. These data were taken based on the results of filling in the performance test instrument containing 40 questions related to students' basic science process skills. The results of the description of the data regarding the basic science process skills in students can be seen in Table 1.

Table 1. Results of Research Data

	Before	After
The Highest Score	30	37
The Lowest Score	14	30
Mean	22	34
Standard Deviation	4.85	2.35

Based on Table 1 presented above, it can be seen that the highest total score obtained by students before treatment was 30 and the lowest total score was 14. The highest total score obtained by students after treatment was 37 and the lowest total score was 30. The mean value is 22 (having a percentage of 55%), meaning that the average basic science process skills before the treatment are categorized as sufficient. The mean value is 34 (having a percentage of 85%), meaning that the average basic science process skills after the treatment are categorized as very good. The standard deviation value is smaller than the mean value (4.85 < 22 and 2.35 <34) indicating that the observed data has a homogeneous value. The research data also shows the results of students' basic science process skills for each indicator which can be seen in Table 2.

Tabel 2. The Results of Students' Basic Science Process Skills

Basic SPS	Before	Category	After	Category	Difference
Observing	51.4%	Less	97.1%.	Very Good	40.3%
Classifying	58.3%	Sufficient	95%	Very Good	36.7%
Comparing	46.7%	Less	91.7%	Very Good	45%
Measuring	75%	Good	91.7%	Very Good	16.7%
Communicating	60%	Sufficient	76.7%	Good	16.7%
Inferring	36.7%	Very Less	60%	Sufficient	23.3%

The data presented in Table 2 show that the students reach the highest basic science process skills before treatment in the measuring indicator (75%) which belongs to good category and the highest basic science process skills after treatment in the observing indicator (97.1%) which belongs to the very good category. While the students reach the lowest basic science process skills before and after treatment in the concluding or inferring indicator (36.7 % and 60%) which belongs to the very less category and sufficient category. The percentage before and after the treatment has a positive value because the performance test scores that students get after the treatment are higher than the performance test scores before the treatment. There are four features in Fruit Audio Aroma media that affect each basic science process skills which can be seen in Table 3.

Table 3. Correlation of the Media Fruit Audio Aroma Features with Basis SPS

Fruit Audio Aroma Features	Basic Indicator SPS					
	1	2	3	4	5	6
Three dimentional shape	✓	✓	✓	✓	✓	✓
Fruit-like Color	✓	✓	✓	-	✓	✓
Trilingual Audio	✓	✓	✓	-	✓	✓
Fruit-like Texture	✓	✓	✓	-	✓	✓

Based on Table 3, it can be seen that all the features of the Fruit Audio Aroma learning media affect the indicators of basic science process skills in the form of observing, classifying, comparing, communicating and inferring indicators. For the measuring indicator, the Fruit Audio Aroma learning media influences one distinctive feature of the Fruit Audio Aroma learning media in the form of a three-dimensional shape. Because in a three-dimensional shape there are length, height, and width. The process of testing the data normality was carried out using the Shapiro-Wilk formula which was carried out with SPSS 26. The data were normally distributed if the Shapiro-Wilk value ≤ table value, or a significant value ≥ 0.05. The results of the normality test in this study was 0.0635 which is greater than 0.05. It means that the observed data is normally distributed and meets the normality requirements. So that the data can be used to test the hypothesis. Hypothesis testing in this study was carried out with a non parametric test trough Wilcoxon test, because the number of samples used in this study was only small. The hypothesis is that Fruit Audio Aroma learning media influence students' basic science process skills. The results of testing the hypothesis with a non parametric test trough Wilcoxon test in this study can be seen in Table 4.

Tabel 4. The Results of Testing the Hypothesis with Wilcoxon Signed Ranks Test

Before – After	Zcount	Sig2-tailed
	-2.812	0.005

Table 4 shows that the calculated z count value is -2.812 and the significance (2-tailed) value is 0.005. Because the significance (2-tailed) value is smaller than 0.05 (0.005 < 0.05) so it can be concluded that H_0 is rejected. The rejection of H_0 means that the use of Fruit Audio Aroma learning media affects basic science process skills in the third-graders of SD Negeri Karangasem 2.

Discussion

Piaget's cognitive theory at the concrete operational stage forms the basis for using Fruit Audio Aroma learning media. The concrete operational stage in Piaget's cognitive theory is the stage of cognitive development of children from the age of seven to eleven years. At this stage, children can use their logic with the help of concrete physical objects (Annisa & Sutapa, 2019; Melinda & Saputra, 2021). The concrete object in accordance with the three features of Fruit Audio Aroma learning media, namely the three-dimensional shape feature, audio feature, and fruits-like texture feature. The three media features allow students to measure, observe, listen, and touch the learning media directly. So that the logic of students can also be honed through this learning media. For example,

by touching durian fruit-type media that has a rough, spiny texture, students can think with their logic that they must be careful when holding durian fruit so as not to hurt their hands. Then, by touching and observing the visuals of the banana fruit media, students can think with their logic that bananas have a special characteristic that is shaped like a crescent moon. In addition, by listening to audio that contains the characteristics of fruits, students can know the characteristics of certain fruits that they cannot see such as the taste of the fruit, the texture of the inner fruit, the color of the fruit after peeling, and others.

The use of Fruit Audio Aroma learning media in this study is also in line with Bruner's cognitive learning theory, precisely at the enactive stage in which students learn to use real objects. Bruner's cognitive theory consists of three stages, the order of the stages from the lowest, namely the symbolic stage (learning with abstract logic and symbols) the iconic stage (learning with pictures), and the enactive (learning with real objects) (Sundari & Fauziati, 2021; Unaenah et al., 2020). The enactive stage is a stage of learning using real objects that makes students know an object or event directly without having to imagine it (Abdurrahmansyah et al., 2022; Afidati & Malasari, 2023). The real form of Fruit Audio Aroma learning media and all the features of this media in the form of three-dimensional features, audio, fruits-like texture, and fruits-like aroma are in accordance with Brunner's enactive stage. The four features allow students to see, hear, smell, and touch the media directly. Thus, students can know the characteristics of certain fruits that are observed without having to imagine them first. This causes students to be able to make detailed observations and be able to use their four senses well. The results of direct observation in the enactive stage will affect scientific activities in other basic science process skills, such as classifying, comparing, communicating and make a conclusion. For example, when observing a media type of orange fruit, students will know directly that oranges have an orange color, medium size, and smooth texture. These results can be used by students to classify oranges in certain categories such as color, size, and texture, compare similarities and differences with other fruits, communicate the results in written or spoken form, and make conclusions about oranges.

In addition, the use of Fruit Audio Aroma learning media is also suitable with the value of the high level of learning experience in Edward Dale's cone of experience theory. Dale's cone theory of experience itself is a learning experience theory that is divided into eleven levels. The highest level of the learning experience for students is a direct learning experience related to objects, the environment, humans, animals, plants, and others, while the lowest learning experience is learning with unreal objects (Dewi & Primayana, 2019; Schachter et al., 2016). The use of Fruit Audio Aroma learning media is in accordance with this theory because this media features a three-dimensional shape, three-language audio, fruit-like texture, and fruit-like aroma which will provide a real learning experience for students, students will be faced directly with learning objects, and students can be more active when learning. This is because students can see the visual form of the media, feel the texture of the media, smell the media, and listen to the audio directly. Real learning experiences will make students understand the subject matter easily and students will remember the material for a long time (Cahyaningtyas, 2020; Fitzsimons, 2014). This real (concrete) learning experience can affect students' basic science process skills because students can make observations, measurements, classifications, comparisons, communication, and conclusions that are included in the indicators of basic science process skills by dealing directly with learning objects.

The first indicator of basic science process skills used in this study is observing activity with a percentage of 51.4 % before treatment and percentage of 97.1% after treatment. The percentage shows that the use of Fruit Audio Aroma learning media has a very good effect on observing indicators. In observing activities, students should be able to intensify the use of their senses to collect various observational data (Khamhaengpol et al., 2021; Strømme & Mork, 2021). Before use Fruit Audio Aroma learning media students only observe objects using one senses that is the sense of sight, so that students not get various observational data regarding facts about fruit. After use Fruit Audio Aroma learning media students can observe objects using their four senses so that students get various observational data regarding facts about fruit.

This happens because the observing indicator has a relationship with all the features that the media has. The three-dimensional shape feature makes students activate the use of their sense of sight to see the shape of the media (oval, round, etc.) more clearly and activates the use of their sense of smell to know the aroma of the media. The real fruit-like color feature can make students activate the use of their sense of sight to see in detail the color of the media. The audio feature can make students activate the use of their hearing senses to listen to information on the audio being played. While the texture features similar to real fruit make students able to activate the use of their sense of touch to feel how the texture of the media is (coarse, smooth, prickly).

The second indicator of basic science process skills is classifying activity with a percentage of 58.3% before treatment and 95% after treatment. This percentage shows that the use of Fruit Audio Aroma learning media has a very good effect on classifying indicators. Classification activities are carried out by separating objects according to their characteristics, then grouping them into certain categories (Hasanah et al., 2020; Praseptiangga et al., 2016). Fruit Audio Aroma learning media can make students identify more than five characteristics of certain fruits and categorize them into five different categories (color, shape, size, texture, and taste). Whereas previously

students were only able to identify the characteristics of fruit and categorize fruit into less than three characteristics and only three categories.

This happens because of the influence of all the features of the Fruit Audio Aroma learning media. The shape features of three-dimensional media can make students know the shape characteristics of certain fruits, for example, bananas are like a crescent. Color features similar to real fruit make students know the color characteristics of certain fruits, for example, strawberries have a red color with black spots. The audio feature makes students aware of fruit characteristics that cannot be observed directly, for example, the taste, actual size of the fruit, and the texture of the inside of the fruit. Finally, the texture features similar to real fruit make students know how the fruit skin texture, for example, durian has a rough texture and sharp thorns. Knowing the characteristics of these fruits can encourage students to categorize fruits based on shapes, colors, tastes, sizes, and textures.

The third indicator of basic science process skills is comparing activity with a percentage of 46.7% before treatment and 91.7% after treatment. This percentage shows that the Fruit Audio Aroma learning media has a very good influence on comparing indicators. The main point of comparing activity is to look for similarities and differences in an object. Before using the Fruit Audio Aroma learning media, on average, students could only analyze the similarities and differences of fruit less than four. Fruit Audio Aroma learning media can help students analyze the similarities and differences among the provided fruit because there is a relationship between the comparing indicators with all the features that the media has. Features of three-dimensional shapes, colors similar to real fruit, audio, and texture similar to real fruit help students to know the colors, shapes, sizes, textures, and tastes of fruit so that students can compare the similarities and differences from the observations.

The fourth indicator of basic science process skills used in this study is measuring activities with a percentage of 75% before treatment and 91.7% after treatment. Fruit Audio Aroma learning media has a very good effect on this indicator based on the percentage. In measuring activities, there is the use of measuring instruments and units that have been determined. The use of Fruit Audio Aroma learning media allows students to measure the length and diameter of the media correctly using standard measuring tools and non-standard measuring tools. In addition, this media also makes students learn to convert one unit into another unit (kilograms into grams, meters into centimeters, etc). This happens because the measuring indicators are related to media features in the form of three-dimensional media shapes. Three-dimensional shape features have a tangible form so that students can calculate the length, width, height, and diameter of the media directly.

The fifth indicator of basic science process skills is communication activity with a percentage of 60% before treatment and 76.7% after treatment. This percentage shows that the use of Fruit Audio Aroma has a good effect on students' communication skills. However, this influence occurs indirectly because it occurs due to the influence of the results of observations on observing indicators and measurement results obtained from measuring indicators. In addition, other factors influence this indicator. One of which is the courage of students when speaking. Communication activities can be carried out in two ways, namely orally (speaking directly) and written (via graphs, tables, and charts) (Bagon et al., 2018; Hasanah et al., 2020). On this indicator, the average student can write more than five descriptions of fruits well and can convert measurement data into tables, graphs, and bar charts. However, in terms of asking questions, the average student can only ask one or two questions.

The sixth indicator of basic science process skills is concluding or inferring activity with a percentage of 36.7% before treatment and 60% after treatment. This percentage means that the use of Fruit Audio Aroma learning media has a sufficient influence on students' concluding skills. The activity of writing statements and explaining written statements is part of concluding (Windari & Yanti, 2021; Wulandari, 2022). On average, these Fruit Audio Aroma learning media help students to be able to write and explain three to four conclusions regarding the series of activities that have been carried out. This happens because the inferring indicator relates to all the features of the Fruit Audio Aroma learning media so that conclusions about fruit can be drawn.

The student's highest score in basic science process skill occurs in observing activities and the lowest score in basic science process skills occurs in concluding activities. Observing activities in basic science process skills (BSPS) have the highest score because students can use their senses to the possible maximum extent. The use of the senses to the possible maximum extent causes students become more active during the learning process (Rahayu et al., 2021; Restiani et al., 2022). The activities of concluding in the basic science process skills have the lowest score because some students are still confused and do not understand the activities. The difficulty in concluding is also influenced by the critical understanding that each student has.

The implication of this research is to optimize basic science process skills in elementary school students by fulfilling all indicators of basic science process skills. Optimal basic science process skills make students more active, have the ability to think critically, and think scientifically. However, there are still limitations in this study, namely the audio on the media cannot be played without an internet connection and the audio only contains features of fruits that do not explain the parts of the fruit and variants of fruit types (for example malang apples, fuji apples, envy apples, etc.). Therefore, further research can add other features to the media.

4. CONCLUSION

The results showed that the use of Fruit Audio Aroma learning media affected basic science process skills in the third graders of SD Negeri Karangasem 2. Fruit Audio Aroma learning media has a positive effect on all basic science process skills indicators, especially in observing, classifying, comparing, and measuring with very good categories. While the communicating and inferring indicators has a good and sufficient categories. The future researchers should add the process of optimizing integrated science process skills instead of focusing only on basic science process skills. The optimization process can be carried out by adding more features in Fruit Audio Aroma learning media such as animated video containing everything about fruits or using even more innovative learning media.

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