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# IMPLEMENTATION OF PROBLEM-BASED SCIENCE LEARNING ON GAUGING STUDENTS' LEARNING INDEPENDENT SKILL

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## ABSTRACT

This study aims to determine the implementation of problem-based science learning on the learning independence of fourth-grade students and for student learning independence after the implementation of problem-based science learning. This study used a descriptive qualitative method, with the research subjects being fourth-grade teachers, the principal, and fourth-grade students consisting of 19 students. The research data were generated from interviews, observations, questionnaires, documentation, and were analyzed using the Miles and Huberman analysis model. The results showed that the implementation of problem-based science learning in grade 4 students of SDN Tembalang runs effectively. This is based on the results of observations of teacher activities getting a percentage of 96.87% and student activities getting a percentage of 92.5%. Student independence after the implementation of the problem-based science learning method shows very independent criteria with a percentage of 86% of students being responsible, 75% being active and creative in learning, 78% being able to solve learning problems, and 61% being continuous in learning. This is in accordance with the questionnaire data that shows the percentage of each learning aspect, including the responsibility aspect getting a percentage of 91.75%, active involvement in learning 92.98%, problem-solving ability 89.82%, and learning continuity, 92.98%.

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## Introduction

Education is a crucial priority for everyone, as it impacts a nation's progress. The goal of education today is to create independent, high-quality human resources. Therefore, today's students must be able to learn independently, as this will foster a positive mental attitude.

Independent learning is an effort to carry out learning activities individually to understand material and solve problems. Independent learning provides benefits, according to Sugianto et al (2020)namely, imparting intelligence to others, deepening research, instilling a way of self-employment, and gaining experience. According to Slavin (2009), there are indicators that serve as a reference for independent learning attitudes: being responsible in learning, being active and creative in learning, being able to solve learning problems, and being continuous in learning. Therefore, independent learning must be implemented from an early age.

Early childhood between 6 - 12 years old is included in the Elementary School age group. Syahriani (2024)states that at this age, students can be equipped to learn independently because cultivating independent learning habits can facilitate the development of independent learning attitudes in students. Equipping students with independence from an early age provides benefits such as developing responsibility and discipline, increasing self-confidence, enhancing creativity, and developing social skills.

The initial analysis of learning independence at UPT SDN Tembalang through interviews with teachers and observations of learning activities conducted on October 24, 2024, revealed that teachers used a problem-based learning model. Based on the results of initial observations, it can be seen that in the process of problem-based science learning activities there is student learning independence. This is evidenced by the existence of learning independence indicators in Suciati (2016), Slavin stated where 86% of students are responsible, 75% are active and creative in learning, 78% are able to solve learning problems and 61% are continuous in learning.

One learning model that is efficient and effective in increasing learning independence is Problem Based Learning (PBM). Problem Based Learning is a learning model that uses problems that are relevant in the real world. According to Yuliani (2022)The characteristics of problem-based learning are that learning begins with the presentation of a problem, students actively work in groups to formulate the problem, and then independently study the material related to the problem. The steps for problem-based learning include providing orientation, organizing students, assisting with independent and group investigations, developing and presenting results, and analyzing or evaluating the problem-solving process (Lismaya, 2019).

This problem-based learning method cannot be used in all subjects; only certain subjects can apply it. Subjects that are relevant or suitable for using problem-based learning are Natural and Social Sciences (IPAS). IPAS learning is not simply about explanations from the teacher, but also requires students to directly seek information Wardani et al (2023).

Therefore, efforts to strengthen independent learning need to be carried out systematically and sustainably. Furthermore, the importance of this research aligns with the independent learning policy, which emphasizes the importance of student-centered learning to foster independent learning. This study aims to determine the implementation of problem-based science learning in improving the learning independence of fourth grade students and to determine the learning independence of students after the implementation of problem-based science learning.

## Research Method

This research uses a qualitative method with a descriptive approach. The subjects of this study were the principal, a fourth-grade teacher, and 19 fourth-grade students. The research location was at the UPT SDN Tembalang, Wlingi District, Blitar Regency. The study was conducted during the 2024/2025 academic year. The data collection methods used were interviews, observation, questionnaires, and documentation. The data analysis used by researchers in carrying out research activities is the analysis model from Miles and Huberman. Activity learning and learning independence were analyzed descriptively quantitatively in the form of percentages with equality:

NA: Elementary/High School x 100%

Information :

NA : Final score

Elementary School : Total score obtained

SM : Maximum score

The criteria used to indicate the level of learning activity and learning independence are shown in Table 1 and Table 2 following:

**Table 1.** Learning Activity Criteria

| Percentage (%) of Learning Activities | Criteria |
|---|---|
| 91 – 100% | Very good |
| 81 – 90% | Good |
| 71 – 80% | Enough |
| 61 – 70% | Not enough |
| <60% | Fail |

**Source:**Alexander & Pono, (2019)



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**Table 2.** Criteria of Student Learning Independent Skill

| Percentage (%) of Learning Independence | Criteria |
|---|---|
| 90% – 100% | Very Independent |
| 70% – 89% | Independent |
| 60% – 69%% | Quite Independent |
| 50% – 59% | Lack of Independence |
| 0% - 49% | Very less independent |

**Source :** Nazili, (2022)

The reduced data is presented in descriptive narrative form and tables to facilitate understanding and further analysis. Conclusions are drawn based on patterns found in the analyzed data and comparisons with theory and previous research findings.

## Results and Discussion

This research was conducted in May 2025. The informants for this research were the Principal, the fourth-grade homeroom teacher, and fourth-grade students. Learning activities were based on observations, interviews, and questionnaires. Meanwhile, student learning independence was based on questionnaires. The results of the research are described as follows:

### 1. Learning Activities

Based on interviews with the principal, it was discovered that all students are required to be independent in their learning. This is supported by the principal's regulations regarding independent learning. The first regulation is the use of digital learning media, which must be used by teachers twice a week. The second regulation is that teachers must assign homework, either verbally or through fourth-grade groups. Assigning these assignments will have a positive impact on students, allowing them to assess their own abilities by completing the exercises provided by the teacher. Purnamasari & Widodo (2018)The third rule requires teachers to be able to handle any student issues by taking an individual approach directly during the learning process. This aims to help students understand the material and participate optimally in the learning process.

Based on the results of interviews with fourth-grade teachers conducted on May 14, 2025, it was found that fourth-grade students were independent in learning, students were able to manage their time in learning and were able to follow habits before and after the teaching and learning process. The class teacher explained that fourth-grade students could complete assignments on time, were enthusiastic in learning and matched with the material given by the teacher. Students were also active in participating in the learning process by always asking the teacher when experiencing difficulties and always trying to find references in the library.

**Table 3.** Summary of Teacher Activities

| No | Aspect | Implemented indicators |
|---|---|---|
| 1 | Pre-Learning | 10 |
| 2 | Initial Learning Activities | 15 |
| 3 | Core activities | 51 |
| Amount | | 76 |
| Presentation | NA : Elementary/high school X 100% | 95% |

Observations of teacher activities were carried out on May 7-14, 2025, regarding learning methods that focus on problem-based science learning. This observation was carried out in two observations. The first observation was carried out on May 7, 2025. In this observation, the Science subject took the material "How to Get All Our Needs". By implementing a problem-based learning model, it can produce an interesting, interactive learning experience and achieve learning objectives. Pre-learning observations showed that with the first indicator, namely preparing the classroom, the teacher arranged the classroom very neatly, the floor was clean, chairs and tables were arranged. The second indicator, preparing learning media, the teacher prepared learning media very well, according to student needs. In the pre-learning aspect, the score was 10.

The initial learning activities, based on observations, showed that in the first indicator, namely reading a prayer together, the teacher read the prayer together in a loud, clear, solemn voice with full awareness and reverence. The second indicator, namely checking student attendance, found that the teacher checked student attendance systematically and on time, paid special attention to students who were absent and followed up to ensure the attendance of absent students. In the aspect of initial learning activities, the score was 15.

The core activities of the observation results show that in the first indicator, namely explaining the orientation of the problem, the teacher obtained, namely 1) the teacher explained the objectives and intentions of



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learning by providing examples with everyday life, 2) the teacher has conveyed the problem by giving students the opportunity to discuss with each other and develop students' critical thinking skills through agreed discussion rules, 3) the teacher is very concerned about the context of the problem raised and its relevance to everyday life, 4) the teacher has been effective in assisting students to form groups, ensuring all students are involved and understand the task. The second indicator, namely organizing students to research, obtained results, namely 1) the teacher gave LKPD IPAs assignments that were very relevant to the material, challenging and spurring students' critical thinking and the teacher saw and ensured that group members understood their respective tasks before the discussion activity.

The third indicator, namely the third indicator, namely helping group investigations, obtained results that the teacher was very effective in facilitating by providing discussion rules that require each group to ask questions to other groups. The fourth indicator, namely the fourth indicator, namely developing and presenting results. The teacher effectively helped students when the group presented the results of the discussion by giving time. The fifth indicator, namely analyzing and evaluating problem solving, obtained results: 1) students could solve the problem. The teacher was very effective in encouraging all groups to provide feedback that builds knowledge to other groups. 2) The teacher has conducted an evaluation that is acceptable to students in identifying the strengths and weaknesses of the discussion results clearly. In this activity aspect, the score was 51.

Based on the data analysis results outlined by the researcher above from three aspects of the activity, the second observation of teachers using problem-based learning achieved a 95% implementation percentage. According to Alexander & Pono (2019) regarding the learning implementation criteria in Table 1, problem-based learning in the science subject applied by teachers is classified as very good.

**Table 4.** Summary of Teacher Activities

| No | Aspect | Implemented indicators |
|---|---|---|
| 1 | Pre-Learning | 10 |
| 2 | Initial Learning Activities | 15 |
| 3 | Core activities | 54 |
| Amount | | 79 |
| Presentation | NA : Elementary/high school X 100% | 98.75% |

This second observation was conducted by the researcher on May 14, 2025. In this observation, the science subject took the topic "Building a Civilized Society". In this study, the teacher used the help of a cultural parade video from Tembalang Village as a learning aid. The pre-learning aspect of the observation results showed that the first indicator, namely preparing the classroom, the teacher arranged the classroom very neatly, the floor was clean, chairs and tables were arranged. The second indicator, namely preparing learning media, found that the teacher prepared learning media very well, in accordance with real life in the school environment. In the pre-learning aspect, the score was 10.

Aspects of initial learning activities. The results of the observation obtained results, namely in the first indicator is reading a prayer together, the teacher reads the prayer together in a loud, clear, solemn voice and with full awareness and reverence. The second indicator is checking student attendance, the result is that the teacher checks student attendance systematically and on time, pays special attention to students who are absent, and follows up to ensure the presence of absent students. The third indicator is providing apperception and literacy, the result is that the teacher provides innovative apperception and in-depth literacy, and there is a clear connection with the learning material and increases student interest in learning. In the aspect of core activities, the score is 15.

Core activity aspects. The results of the observation obtained results, namely with the first indicator, namely providing orientation about the problem to students, obtained results, namely 1) the teacher explained the objectives and intentions of learning very clearly and specifically and provided direct examples of village customs that students had actually carried out to be learned, 2) conveying problems that would be solved in groups obtained results that the teacher had conveyed the problem very clearly, motivated students, provided students with opportunities to discuss and develop students' critical thinking skills. 3) paying attention that the problems raised should be contextual obtained results that the teacher paid close attention to the context of the problems raised and their relevance to everyday life. 4) accompanying group formation obtained results that the



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teacher had been effective in assisting students in forming groups, ensuring all students were involved and understood the task.

The second indicator, organizing students to conduct research, has two sub-indicators. First, assigning tasks related to science and natural sciences, found that the teacher gave science and natural sciences assignments that were highly relevant to the material, challenging, and stimulated students' critical thinking. The third indicator, assisting group investigations, with the sub-indicator of assisting student involvement or activeness in collecting data during the discussion process, found that the teacher was very effective in facilitating the involvement of all students in collecting data during the discussion.

The fourth indicator, developing and presenting results, has two sub-indicators: first, assisting in preparing student discussion results to be presented, found that the teacher was very effective in preparing systematic, neat discussion results ready for presentation. The fifth indicator, analyzing and evaluating problem-solving, found that the teacher was very effective in encouraging all groups to provide constructive and specific feedback to other groups. Furthermore, evaluating discussion results found that the teacher had conducted a comprehensive evaluation, clearly identifying the strengths and weaknesses of the discussion results. In the final aspect, namely core activities, obtained a score of 54.

Based on the data analysis described by the researcher above from three aspects of the activity, the second teacher observation using problem-based learning achieved a 98.75% implementation percentage. According to Alexander & Pono (2019) regarding the learning implementation criteria in Table 1, the problem-based learning implemented by the teacher in the science subject is classified as very good.

**Table 5.** Summary of Student Activities 1

| No | Aspect | Implemented indicators |
|---|---|---|
| 1 | Listening and explaining problems | 5 |
| 2 | Forming a Group | 5 |
| 3 | Analyzing Tasks | 4 |
| 4 | Discussing and Finding Data | 4 |
| 5 | Investigating the problem | 4 |
| 6 | Share tasks and generate solutions | 4 |
| 7 | Presenting | 4 |
| 8 | Providing Feedback | 5 |
| Amount | | 35 |
| Presentation | NA : Elementary/high school X 100% | 87.5% |

Observation of student activities in the learning process with problem-based learning methods in the subject of science. This study was conducted on May 14 to 21, 2025. The first observation found that the use of problem-based learning models had a positive impact on students, namely being more independent, active and responsible in learning. The first indicator focused on listening and explaining problems given by the teacher, getting the results that students had listened actively and showed full attention, and were able to re-explain the problem clearly by getting a score of 5. The second indicator was able to form groups independently, getting the results that students were very active in the process of forming groups, able to invite other members to agree on roles and be open by getting a score of 5. The third indicator was able to explain problems related to the task, getting the results that students had analyzed the task well, understood most of the components and were able to explain their meaning logically and getting a score of 4. The fourth indicator was able to discuss to divide tasks and was active in finding the data needed to solve the problem, getting the results that students had actively discussed and provided good responses and were able to find data from several sources that were quite appropriate, getting a score of 4.

The fifth indicator, able to investigate problems for discussion and presentation materials, obtained results that students have investigated the problem quite well, using several sources and demonstrating an understanding of the core of the problem for discussion and presentation materials, obtained 4. The sixth indicator is able to divide tasks to produce solutions and solve problems that get results that the division of tasks is quite good, most members know their responsibilities and the solution is quite logical and in accordance with the problem discussed, obtained a score of 4. The seventh indicator, dare to appear to present the results of their work, obtained results that students have conveyed the results quite clearly, structured and confidently, obtained a score of



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4. The eighth, able to provide feedback in the form of appreciation or questions, obtained results that students provide relevant and clear feedback, although not yet fully constructive or still general, obtained a score of 5.

Based on the results of the data analysis outlined by the researchers from the five stages of the activity, the observation of student activity in following the use of the first problem-based learning model obtained a learning activity percentage of 87.5%. According to Alexander & Pono (2019) regarding the learning implementation criteria in Table 1, problem-based learning in the science subject applied by the teacher is classified as good.

Table 3. Summary of Student Activities 2

| No | Aspect | Implemented indicators |
|---|---|---|
| 1 | Listening and explaining problems | 5 |
| 2 | Forming a Group | 5 |
| 3 | Analyzing Tasks | 5 |
| 4 | Discussing and Finding Data | 5 |
| 5 | Investigating the problem | 5 |
| 6 | Share tasks and generate solutions | 5 |
| 7 | Presenting | 4 |
| 8 | Providing Feedback | 5 |
| Amount | | 39 |
| Presentation | NA : Elementary/high school X 100% | 97.5% |

The second observation found that the use of problem-based learning models on students had a positive impact, namely students became more independent, active and responsible in learning. In this second observation, the scores obtained increased in several stages of the activity. The first indicator focused on listening and explaining the problems given in group form, obtained results that students listened actively, and showed full attention, and were able to re-explain the problem clearly, coherently, and using their own words, obtained a score of 5. Second, being able to form groups independently obtained results that students were very active in the group formation process, able to invite other members to agree on roles and be open, obtained a score of 5. Third, being able to explain problems related to the task, obtained results that students had analyzed the task in depth and thoroughly, identified all important components, and connected them with relevant knowledge, obtained a score of 5.

Fourth, being able to discuss to divide tasks and being active in searching for the data needed to solve the problem, getting the result that the students are very active in discussing, respecting the opinions of others and providing relevant ideas and being able to search for data from relevant, accurate and diverse sources independently, getting a score of 5. Fifth, being able to investigate problems for discussion and presentation materials, getting the result that the students have investigated the problem thoroughly and in depth with a logical and critical approach and using various relevant and reliable sources for discussion and presentation materials, getting a score of 5.

Sixth, being able to divide tasks to produce solutions and solve problems that get results that students have divided tasks fairly and planned, all members understand and carry out their roles and the resulting solutions are logical, and relevant to the problems discussed get a score of 5. Seventh, being brave to appear to present the results of their work gets the result that students have conveyed the results clearly, structured, and confidently get a score of 4. Eighth, being able to provide feedback in the form of appreciation or questions gets the result that students have provided feedback that is relevant, clear, constructive, delivered in polite language and supports improvement gets a score of 5.

Based on the results of the data analysis outlined by the researchers from the five stages of the activity, the observation of student activity in following the use of the first problem-based learning model obtained a learning activity percentage of 97.5%. According to Alexander & Pono (2019) regarding the learning implementation criteria in Table 1, problem-based learning in the science subject applied by the teacher is classified as very good.

## Learning Independence

Based on the distribution of the learning independence questionnaire given to 19 students consisting of 8 male students and 11 female students, it shows that students are independent in learning with a percentage of 91.88%. The results obtained can be seen from the data analysis with aspects of learning independence, namely being responsible in learning, being active in learning, solving learning problems and being continuous in learning, as described in Table 3 as follows:

**Table 3.** Summary of Student Learning



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Independence Questionnaire

| No | Indicator | Presentation |
|---|---|---|
| 1 | Responsible | 91.75% |
| 2 | Be Active in Learning | 92.98% |
| 3 | Able to Solve Problems | 89.82% |
| 4 | Continuous Learning | 92.98% |

First, the responsible aspect consists of three indicators, namely, first, not delaying time in doing assignments consisting of three statements. Next, the second indicator completes the teacher's assignments consisting of three statements. And the third indicator does not give up easily when facing problems consisting of two statements. From the explanation, the responsible aspect has eight statement items with a percentage of 91.75%. Next, the second indicator likes high creativity consisting of three statements. From the explanation, the aspect of being active in learning has five statement items with a percentage of 92.98%. Third, the aspect of being able to solve learning problems consists of two indicators, namely first, having confidence in doing school assignments consisting of three statements. Next, the second aspect is being able to make their own decisions consisting of two statements. From the explanation, the indicator of being able to solve learning problems has five statement items with a percentage of 89.82%. Fourth, the continuous learning aspect consists of an indicator of paying attention to readiness in learning consisting of two statements. With this explanation, the continuous learning aspect has two statement items with a percentage of 92.98%.

Interviews with the principal and teachers revealed that the process supporting fourth-grade students' independent learning is very positive and effective. This is evident in the students' ability to manage their classroom time, complete assignments on time, take responsibility for their work, and actively participate in the learning process. This achievement is attributed to the principal's policy requiring teachers to consistently interact with students in their learning responsibilities. This question aligns with the opinion of Greene et al (2004)which explains that educators who succeed in creating good interactions with students and can determine clear targets and apply efficient learning methods will provide motivation for student policies and independence in the learning process.

The principal's next regulation to encourage student learning independence requires teachers to use engaging and interactive learning media to encourage student engagement during the learning process and create a more engaging learning environment. Based on this regulation, a fourth-grade teacher stated that fourth-grade students were active and creative during the lesson. This is because the fourth-grade teacher uses supporting learning media, namely everyday learning media that engage students in the learning material. This statement aligns with the definition ofNurrita (2022)regarding learning media which states that learning media is a tool that can support the teaching and learning process so that teachers can convey learning materials more clearly and aim to obtain maximum results in the learning process.

Based on the discussion above, supported by observations of teacher and student activities during science lessons, the results of a study of fourth-grade teachers on the use of problem-based science learning showed that implementing a problem-based learning model in science lessons had a positive impact on students. This statement aligns with the results of research fromAsiah et al (2024)which states that Problem Based Learning (PBM) is very appropriate and effective in improving students' understanding of science subjects.

Student activities in participating in problem-based learning in the science subject have shown a positive influence in improving their understanding of the subject, enabling them to create a healthy and conducive learning environment. This statement aligns with the opinion of Asiah et al (2024)which states that problem-based learning (PBL) implemented in elementary schools is highly effective and can improve student understanding. At this stage, students actively exchange ideas, which are then used to solve problems. Then, students are able to present the results of their discussions to the class, which fosters communication skills and public speaking skills.

Problem-based learning conducted by the fourth-grade teacher resulted in students participating in the learning very actively. This is in accordance with the statement of opinion. Yuliani (2022)which explains that problem-based learning requires students to be more active in learning and teachers only act as facilitators. This learning model is a model that prioritizes active student learning activities and can improve students' analytical skills. Hasanah et al (2021). In the problem-based learning process implemented by the fourth-grade teacher, the class became conducive and very interactive.

In problem-based learning, the teacher only acts as a facilitator for students. This is explained by Yestiani (2020)which states that the teacher's role as a facilitator is to provide services so that students can easily receive and understand learning materials. Based on the statement above, it can be concluded that this problem-based learning model implemented by fourth-grade teachers will foster a sense of responsibility in learning and independence in learning because problem-based



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learning focuses on problems applied in everyday life.

This is supported by a questionnaire given to fourth-grade students, which found that fourth-grade students are highly independent in their learning. These results can be seen in detail in Appendix 22. Starting with the first aspect, namely responsibility in learning. Responsibility in learning will foster discipline in students, achieve success in learning, and can help students develop their potential and creative abilities. The statement above aligns with the opinion of Atthohiri (2022)which states that responsibility in learning will have a significant impact on student learning outcomes. With responsibility, students will develop a mature attitude toward learning at school and can help them become better individuals.

The second aspect is active learning. An active attitude in learning will provide benefits to students, including improving their understanding of the material, increasing motivation, and reducing learning difficulties. This statement is supported by Princess (2019)which states that students' active attitudes will reduce their difficulties in the learning process if students find it easy to understand the material given by the teacher, this will encourage them to be motivated to study the next material.

The third aspect is the ability to solve learning problems. Having self-confidence in students will provide benefits, such as the courage to ask questions and participate in class discussions, the courage to take risks and not be afraid of failure, and the ability to recognize their strengths and weaknesses and focus on developing their strengths. This is in line with the opinion of Humaeroh et al (2024)which states that good self-confidence plays an important role and has a positive impact on various aspects of life, including academic achievement, social interaction and problem solving.

The fourth aspect is continuity in learning. This statement is in accordance with the opinion of Setyawan (2024)This continuous learning process will help students gain a deeper understanding of the learning material, their passions, interests, talents, and potential. It will also broaden their knowledge and insight to develop and enhance their skills.

## Conclusion

The implementation of the problem-based science and science learning method at Tembalang Elementary School has proven effective in increasing the learning independence of fourth-grade students and facilitating teachers' learning. This is consistent with the results obtained from observations of teacher activities, which obtained a percentage of 96.87%. With this achievement, observations of teachers in using the problem-based learning model showed very satisfactory results. Observations of student activities obtained a percentage of 92.5%. With these results, problem-based learning can hone students' abilities in critical thinking, analyzing problems, and developing solutions independently.

Students from grade IV of Tembalang Elementary School demonstrated independent learning after implementing the problem-based science learning method. This is in accordance with the results obtained by students in each aspect of independent learning, showing very independent criteria. First, in the aspect of responsibility, students obtained a percentage of 91.75%, second, for the aspect of active involvement in learning, the percentage was 92.98%, third, in the aspect of problem-solving ability, the percentage reached 89.82%, and fourth, in the aspect of learning continuity, they also obtained a percentage of 92.98%.

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