

Students' Mathematical Literacy Ability in Learning Using Rally Coach-Schooly Model with Diagnostic Assessment

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Abstract

Students' low mathematical literacy ability causes the need for a learning using the right model, media and assessment to fix it. One of the alternatives is Rally Coach-Schooly model with diagnostic assessment. This research aims (1) to know the quality of learning using Rally Coach-Schooly model with diagnostic assessment towards the students' achievement of mathematical literacy ability, and (2) to describe the results and follow-ups of diagnostic assessment in such learning. This quantitative research was done by quasi experimental design. The population was the students grade VIII of SMPN 4 Semarang in 2017/2018 academic year with the students of VIII D and VIII E as samples. The data were collected by documentation, observations, giving tests and questionnaire, and validations by experts. Data analysis was done both empirically and statistically using one-sample t test, proportion test, independent-samples t test and proportions comparison test. Results showed that (1) the learning using Rally Coach-Schooly with diagnostic assessment was qualified towards the achievement of students' mathematical literacy ability, and (2) both students with low and moderate mathematical literacy ability had difficulties in relating problems to the useful concepts for problem solving, while students with high mathematical literacy ability were careless in doing mathematical operations. The follow-ups were done by peer tutoring and giving certain assignments according to students' difficulties, therefore students' mathematical literacy ability could be developed which can be seen from the average score of their final test results 74.58 and 88% of them got scores above the minimal completeness criteria.

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INTRODUCTION

As the time goes by, people are required to respond various problems which might occur in the daily life. It causes the need for learning mathematics, especially at school, so that people will have attitudes and abilities to think logically, analytically, systematically, critically and creatively (Wardono, et al. 2015) in order to solve the problems.

One of mathematical abilities which is important to face the real life problems is mathematical literacy ability (Lailiyah, 2017; Machaba, 2018). It is based on the definition of mathematical literacy according to OECD (2016) that is students' ability to identify and to understand the importance of mathematics in life, to make decisions mathematically based on the needs and one's future to be a constructive, caring and reflective citizen. According to Magen-Nagar (2016), such definition refers to two abilities, that is the ability to do mathematical operations and to apply mathematical knowledge to solve problems in various situations.

The result of a survey conducted by Program for International Student Assessment (PISA) which gave assessment toward students' mathematical literacy ability showed that Indonesian students' mathematical literacy ability was not maximal. Based on the survey, Indonesia was the 61st of 70 participants in 2015 (OECD, 2016). Such result proves that the mathematical literacy ability of Indonesian students needs to be improved in order to compete with the other countries.

The low mathematical literacy ability was also found in the VIII graders of SMPN 4 Semarang in 2017/2018 academic year. Their mathematics teacher said that some of the students were having trouble in understanding a problem, making mathematical forms of the problem, as well as relating the learned mathematical concepts to the context of problem in problem solving. Therefore, some efforts must

be done to develop the students' mathematical literacy ability.

According to Diyarko & Waluya (2016), one of the factors which causes the low mathematical literacy ability is the less supportive learning method and media. A learning which supports the improvement of students' mathematical literacy ability is one which gives students opportunities to solve the non-routine problems which is related to the students' daily lives (Febriyana, et al. 2018). The problem solving activity is appropriate to the focuses of mathematical literacy, they are analyzing, revealing arguments, giving effective ideas, formulating, carrying out and interpreting a mathematical problem in the various forms and situations (Fathani, 2016). Such learning must certainly be adjusted to the curriculum used in any school.

The 2013 curriculum which is currently applied in many schools has recommended some learning models with scientific approach and the use of proper medias to reach the learning goals. One of the learning models is Problem Based Learning (PBL). This model requires the students to study through a group discussion as well as problem solving to establish or deepen their understandings.

Based on an interview with the mathematics teacher in SMPN 4 Semarang, students were usually asked to discuss within a group which contained 4 until 5 pupils. According to Juniati (2017), this kind of discussion is often dominated by either one or several group members. It shows that the teacher needs to develop the model to make all of the students participate actively in the discussion activity to solve problems so that each student's mathematical literacy ability would be improved.

Rally Coach is one of the alternative learning models which can promote students' mathematical literacy ability. Ningsih, et al (2017) stated that the learning steps of Rally Coach are (1) student A tries to solve a given problem, (2) student B pays attention, checks

and gives a reward if student A answers correctly. (3) student B tries to solve a given problem. then (4) student A pays attention. checks and gives a reward if student B's answer is correct. In this learning model. students are asked to solve some contextual problems in a small group or pair in order to minimize the existence of any sleeping partners during the discussion process. Setiani. et al (2018) stated that the use of contextual problems which are related to the daily life during the learning process can make the students' mathematical literacy ability better.

In addition. the right learning medias also affect the students' mathematical literacy ability (Diyarko & Waluya. 2016). One of the medias is Schoology. The use of Schoology in the learning process facilitates the students to study. discuss and practice to solve mathematical literacy problems without time and place limitations. so that the learning goals can still be reached (Wardono. et al. 2018). It means that students can keep developing their mathematical literacy ability eventhough the time of learning at school is limited.

The students' low mathematical literacy ability shows the need for the appropriate assessment to identify every student's weaknesses and to decide a further step to fix the weaknesses. one of them is diagnostic assessment. Geller & Yovanoff (2009). Permata. et al (2017) and Shim. et al (2017) conveyed that diagnostic assessment can help the teacher to evaluate students' weaknesses specifically or students' misconceptions of the prerequisites needed to master the material which is being learned. By doing diagnostic assessment. teacher can detect the students' weaknesses of every mathematical literacy aspect.

The advantages of Rally Coach model. Schoology and diagnostic assessment above shows that those model. media and assessment can be used in a learning process. The learning steps of Rally Coach model makes the students solve some contextual problems cooperatively in pairs and diagnostic assessment in the end of the

learning at class helps the teacher to find out students' difficulties in a certain submaterial so that the follow-ups can be decided to overcome those difficulties. such as short peer tutoring and giving assignments through Schoology based on the students' difficulties. Schoology and its features can also be used to give the students some assignments. information and problem solving exercises about the material to deepen their understandings and improve their mathematical literacy ability. Thus the learning using Rally Coach-Schoology model with diagnostic assessment is expected to be able to develop the students' mathematical literacy ability.

According to the background above. the objectives of this research are (1) to know the quality of the learning using Rally Coach-Schoology with diagnostic assessment towards the students' achievement of mathematical literacy ability. and (2) to describe the results and follow-up of diagnostic assessment in the learning using Rally Coach-Schoology model.

METHODS

This quantitative research used quasi experimental design which was combined with pretest-posttest control group design. This research was conducted in SMPN 4 Semarang with the population was the VIII graders of the 2017/2018 academic year. The samples were the students of VIII D class as the experimental group and the students of VIII E class as the control group. During this research. students studied about statistics and probability. The experimental group learned using Rally Coach-Schoology model with diagnostic assessment. while the control group learned using PBL-scientific model.

Data collection techniques used in this research were documentation. validations by some experts. observation. test and questionnaire. Documentation method was done using the students' final semester exam result as the initial data. The initial and final

tests was given to obtain the data of students' initial and final mathematical literacy ability. Diagnostic test was given to identify students' learning difficulties about a certain submaterial at the end of every meeting. Students were also asked to fill the questionnaire to obtain the data of students' responses toward the learning using Rally Coach-Schoolology with diagnostic assessment. The learning implementation and students' activity datas were obtained by observation during the learning process by an observer. Thus the instruments used in this study were validation sheets, the initial, final and diagnostic tests problems, the observation sheets of learning implementation and students' activity, and a questionnaire about students' responses toward the learning.

The data were then analyzed both empirically and statistically. The data of the initial test result was analyzed by normality test, homogeneity test and independent-samples t test. The data of the final test was analyzed by normality test, homogeneity test, one-sample t test according to the individual minimal completeness criteria which is 61, proportion test, independent-samples t test and proportions comparison test.

The quality of learning using Rally Coach-Schoolology with diagnostic assessment was based on the preparation, implementation and evaluation result. The preparation step is said to be qualified if the learning devices are valid according to the validation results by the experts, and the result of trial test shows that the test problems are valid, reliable, having at least adequate discrimination power and normal difficulty level. The implementation of the learning using Rally Coach-Schoolology with diagnostic assessment is said to be qualified if the observation results of learning implementation and students' activity are at least having good criteria, and students' responses toward the learning are positive.

The quality of evaluation result is based on the effectiveness of such learning toward the students' achievement of mathematical literacy

ability. The learning using Rally Coach-Schoolology model with diagnostic assessment is said to be effective if the average of students' mathematical literacy ability is higher than the minimal completeness criteria, the completeness proportion of the experimental group is more than 75%, the average of students' mathematical literacy ability and completeness proportion of the experimental group are better than the control group.

RESULTS AND DISCUSSIONS

This research was started by collecting and analyzing the initial data which showed that the population were normal distributed, homogeny and had similar averages so that the samples can be chosen, they were the students of VIII D class as the experimental group and the students of VIII E class as the control group. Both groups were given an initial test to measure the students' mathematical literacy ability as the initial data. The analysis result of the initial data showed that both sample groups were homogeny, had a normal distribution and the similar averages. It means that the students' mathematical literacy abilities of both experimental and control group were equal, therefore different treatment can be given to the both sample groups to identify the effectiveness of the learning using Rally Coach-Schoolology with diagnostic assessment towards the students' achievement of mathematical literacy ability. The experimental group learned using Rally Coach-Schoolology with diagnostic assessment, while the control group learned using PBL-scientific model.

The Quality of Learning Using Rally Coach-Schoolology with Diagnostic Assessment

Learning quality contains of three steps, they are preparation, implementation and evaluation result. Learning preparation is done in order to make the learning process going well and well prepared so that the objectives are reached (Nursalam & Rasyid, 2016). The

preparation was done by creating and validating the learning devices by some experts as well as holding a trial test for the expediency of the initial and final test problems which would be used during the study. The trial test result showed that each of the seven problems provided for the initial and final test were valid, reliable, having at least adequate discrimination power and normal difficulty level. The revisions of the learning devices were done according to the experts' recommendations.

Table 1. The Validation Results of Learning Devices by The Experts

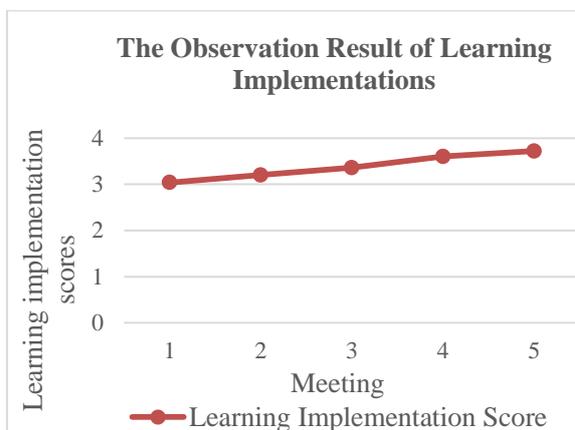
Learning Devices	Validation Marks(%)
Syllabus	85.5
Initial test problems	88
Final test problems	87
Lesson plan	86
Learning material	87
Worksheet	87
Observation sheet of learning Implementation	85
Questionnaire of Students' Responses	87.5

The learning devices in this research is said to be valid if they got the validation score at least 61% and is said to be very valid if they got the evaluation score at least 81% (Centaury, 2015). The validation results were generally more than 81% which can be seen in Table 1. Thus, the learning devices are included to the very good criteria so that it can be used to implement the learning using Rally Coach-Schoolology model with diagnostic assessment.

The learning process using Rally Coach-Schoolology with diagnostic assessment was started by giving apperceptions to the students. Teacher told the learning goals and describe a real life problem related to the material. Teacher then divided the students into pairs and gave them some problems through a worksheet. Teacher asked a member of each group to solve a problem coached by their own partners. The

partner paid attention and corrected the solving steps if there were any mistakes and gave a reward when their partners were successful in solving the problem. Students did such activity once again but the role of each student in every pair was exchanged. After the students finished the pair discussion, some students presented their work to the others, then the teacher confirmed and gave them some rewards. Teacher then gave a diagnostic test to measure students' understanding and to find students' difficulties about the material. Based on the diagnostic test result, teacher conducted a short peer tutoring to discuss about the problems and gave some certain assignments to the students who were still having difficulties as the follow-ups. Teacher also gave assignments to the students who could answer the diagnostic problems correctly. Those assignments were given and must be collected using Schoolology. Students could also discuss with the other students and ask the teacher about their difficulties or curiosity about the materials.

The implementation step was viewed from the observation results of the learning implementation and students' activity as well as their responds toward the learning using Rally Coach-Schoolology with diagnostic assessment. The observation result of the implementation showed that such learning process had good criteria whose score kept increasing into very good criteria during the five meetings. This observation was based on the lesson plan designed before. A learning which facilitates the students to be actively engaged must be prepared and done systematically (Choirudin, 2017), therefore the learning process can be directed well until the goals are reached. The increasing of the learning implementation scores can be seen in Picture 1.



Picture 1. The Increasing of Learning Implementation Scores

Based on the fulfillment of the response questionnaire, the average of students' response percentages toward the learning using Rally Coach-Schoology with diagnostic assessment was 81.43%. Arikunto (2010) claimed that if the students' response percentage is more than or equal to 80% then they show the very positive responses. It means that the students gave the very positive responses toward the learning using Rally Coach-Schoology with diagnostic assessment and believed that it was fun and useful for their understanding to the materials and the development of their abilities. The very positive responses were also affirmed by the fact that 50% of the students participated actively in every meeting.

The results of the implementation step were also confirmed by the research result of Ningsih, et al (2017) that the implementation of Rally Coach model promoted students' activity in seeing, speaking, listening, writing and mentality during the learning process. Students' activity was supported by the use of Schoology which facilitated them to communicate freely and participate in a group discussion just like Wardono, et al (2018) stated. The statement is in line with the research result of Irawan, et al (2017) which showed that Schoology reinforced the students to learn actively not only inside but also beyond the classroom because they could seek any information from various sources independently and improve the students'

interaction in order to share the information. In addition, the diagnostic assessment which was done in the end of every meeting also stimulated the students' activity to think and to interact if the follow-up was conducted.

The evaluation result of the learning using Rally Coach-Schoology with diagnostic assessment was seen from the results of the initial and final test of students' mathematical literacy ability. The final test result is summarized in Table 2.

Table 2. The Final Test Results

Aspects	Experimental Group	Control Group
Averages	74.58	66.84
Highest Scores	91.03	88.46
Lowest Scores	52.56	42.31
Standards of Deviation	11.14	12.41
Variances	124.19	154.05

The results of statistical tests showed that the average of students' final test score of mathematical literacy ability after doing the learning using Rally Coach-Schoology with diagnostic assessment reached more than the minimal completeness criteria which was 61. In addition, students' completeness proportion was also more than 75%. These are in line with the research results of Wardono, et al (2018) and Sriyatun, et al (2018) which showed that the mathematical literacy ability of the students who learned using Schoology reached the classical completeness.

The achievement of students' mathematical literacy ability can be reached because the learning using Rally Coach-Schoology with diagnostic assessment provides an experience to learn actively, interactively and meaningfully to the students. The use of Schoology significantly affects the students' activity (Nolaputra, et al. 2018). According to Ningsih, et al (2017), a learning using Rally Coach model promotes the students' learning

activity which will also cause the improvement of students' mathematical literacy ability.

The completeness proportion of the students who learned using Rally Coach-Schoolology with diagnostic assessment was higher than the students who learned using PBL-scientific model. The final test result also showed that the learning using Rally Coach-Schoolology with diagnostic assessment improve the students' mathematical literacy ability more significantly than the learning using PBL-scientific model. It can be seen from the equal averages of the students' mathematical literacy ability before they learned using one of the two models which then changed after they learned using one of those models that the average of mathematical literacy ability and completeness proportion of the students who learned using Rally Coach-Schoolology with diagnostic assessment was higher than the students who learned using PBL-scientific model. It means that the learning using Rally Coach-Schoolology model with diagnostic assessment is effective to improve students' mathematical literacy ability.

The comparison test result above is affirmed by Marlina. et al (2016) who concluded that the implementation of Rally Coach model can improve students' learning achievement. This is in line with the research result of Wicaksana. et al (2017) which showed that the mathematical literacy ability of the students who learned using Schoolology was better than who learned without Schoolology. An affirming research result is also showed by Khaerunisak. et al (2017) that the difference between the averages of the initial and final test results of the students who did the diagnostic assessment was better than ones who did not do the diagnostic assessment.

Based on the description above. the learning using Rally Coach-Schoolology with diagnostic assessment in this study had good qualities of preparation and implementation. Such learning was also effective to promote the students' achievement of mathematical literacy ability based on the reached individual and

classical completeness as well as its comparison result to the students who learned using PBL-scientific. It means that the evaluation result of the learning using Rally Coach-Schoolology with diagnostic assessment was qualified. Thus. it can be said that the learning using Rally Coach-Schoolology with diagnostic assessment is qualified towards the students' achievement of mathematical literacy ability.

Results and The Follow-Up of Diagnostic Assessment

The diagnostic assessment in this study was done by giving a diagnostic test at the end of every meeting to the experimental group. Based on the test result. the students who still had difficulties were given the follow-up in the form of remedial teaching. According to the National Education and Culture Ministry (Hikmasari. et al 2017). the forms of remedial teaching are (1) re-teaching the materials. (2) certain guidances. (3) certain assignments. and (4) peer tutoring. The remedial which is considered as the follow-up of diagnostic assessment is the appropriate treatment to improve students' achievement so that they can satisfy the learning completeness (Kartono. et al. 2016).

Based on the final test result. students were categorized into the low. moderate and high mathematical literacy ability. There were 6 students with low mathematical literacy ability. 25 students with moderate mathematical literacy ability and 4 students with high mathematical literacy ability.

At the first meeting. students learned about analysis of the given data distribution. means. median and mode of any data. After they did the diagnostic test in a multiple choice form. there were 1 student with low mathematical literacy ability. 4 students with moderate mathematical literacy ability and 2 students with high mathematical literacy ability gave the wrong answer to the problem number 2. The option A was the right answer for this problem. A student with low mathematical

literacy ability answered the option D which means that he/she can not relate and apply the concepts that had been learned before to solve the problem. The other 6 students chose the option B. which means that they still had weakness or careless while calculating in problem solving process.

Students who answered the problem number 3 incorrectly were 1 student with low mathematical literacy ability, 2 students with moderate mathematical literacy ability and 1 student with high mathematical literacy ability. The right answer of this problem was D. Those four students answered B which means that they have already understood the meaning of mode, but still unable to determine a median of the data.

Students who answered incorrectly were given a follow up by a short-timed peer tutoring activity to discuss the problem solving steps and any concepts which is related to the problem. This activity is in line with the research result of Prasojo (2016) that peer tutoring can promote students' learning achievement. Furthermore, a certain assignment was given to overcome their learning difficulties about the material learned at the first meeting based on the diagnostic test result.

At the second meeting, students learned the range, quartiles and interquartile range of a data. After did 2 problems in the diagnostic test, there were 8 students who answered incorrectly. The right answer of this problem was C. Two students with low mathematical literacy ability, 2 students with moderate mathematical literacy ability and a student with high mathematical literacy ability answered the option B. It means that those five students had understood the way to find the range, but had difficulties to find the quartiles and interquartile range. A student with low mathematical literacy ability and 2 students with moderate mathematical literacy ability answered A. It was detected that these three students were having difficulties on understanding the concept of range, quartiles

and interquartile range so they cannot apply it to solve the problem.

The diagnostic test result at the second meeting generally showed that both students with low and moderate mathematical literacy ability were still having difficulties on relating the problem to the useful concept in problem solving. Students with high mathematical literacy ability had understood the concepts but unable to use it maximally in problem solving. Furthermore, students were given the follow-ups by peer tutoring and a certain assignment based on their learning difficulties. Thus, students' understanding and ability to solve contextual problems about range, quartiles and interquartile range can be developed. This activity is affirmed by Sutriani, et al (2016) who concluded in their research that giving some assignments can improve students' learning achievement.

The material learned at the third meeting was empirical probability of an event. Diagnostic test showed that all of the students could answer the 2 given problems correctly. Teacher ensured the students' understanding about the material by giving one more problem, then they all could answer it quickly.

At the fourth meeting, students were given 2 problems in the diagnostic test about theoretical probability of an event. The test result showed that there were 7 students who answered incorrectly the problem number 2, which was a contextual problem with the right answer A. Three students with low mathematical literacy ability and a student with moderate mathematical literacy ability answered the option B. This means that those four students had not understood the problem well so that the concept and strategy used for the problem solving were incorrect. Three students with moderate mathematical literacy ability chose the option D, which means that they were careless while doing the calculations to find the solution.

After knowing the diagnostic test result, students did the peer tutoring to discuss the solving steps of the problem number 2.

Furthermore, the seven students who were having difficulties above were given a certain assignment in the form of contextual problems about theoretical probability as an exercise.

At the fifth meeting, students learned the relation between empirical and theoretical probabilities. The diagnostic test was done by giving 2 multiple choice problems at the end of the learning process. Results showed that there were 4 students who answered incorrectly for the problem number 1. The right answer was C. Students were asked to determine the ratio of the empirical and theoretical probabilities of an event. Two students with low mathematical literacy ability chose the option A, which means that they had not understood the problem so that they could not apply the concepts of empirical and theoretical probabilities correctly in the problem solving. A student with moderate and high mathematical literacy ability answered D. This means that they were careless while doing the division of the rational numbers at the ultimate solving step.

The diagnostic test result at the fifth meeting showed that students with low mathematical literacy ability had trouble applying the probability concept which had been learned to solve contextual problems, while both students with moderate and high mathematical literacy ability were still careless in doing the mathematical operations. Students then did the peer tutoring to discuss and to confirm the correct solving steps of the given problems. Furthermore, they were given a certain assignment based on their difficulties about the material.

Based on the diagnostic test result of the five meetings, both students with low and moderate mathematical literacy ability generally had a trouble to understand the problem and to use certain mathematical concepts in problem solving. It causes the wrong strategy applied in problem solving. Students with high mathematical literacy ability generally can understand and use the mathematical concepts in problem solving, but sometimes be careless

while doing mathematical operations in the problem solving process.

The result of a summative test at the final test of mathematical literacy ability showed that the average score obtained by the students who had been through the diagnostic assessment was 74.58. This average score has reached more than the individual minimal completeness criteria. In addition, 31 of 35 or 88% of the students got the scores higher than the minimal completeness criteria. It means that the diagnostic assessment as well as the follow-ups gave a significant effect toward the students' achievement of mathematical literacy ability. This is in line with a research result of Arifin, et al (2019) that the result of the follow-up of diagnostic assessment which was appropriate to students' learning difficulties influenced significantly on students' mathematical literacy ability.

Remedial activities, such as peer tutoring and certain assignments which were the follow-ups of diagnostic assessment aimed to make the students able to rewrite the problem solving steps based on the hints either given by the teacher or written in the book and to apply such strategy to solve the familiar problems. Therefore, students can identify their own difficulties in problem solving and overcome their understanding and problem solving strategy. This is in line with Khaerunisak, et al (2017) and Suwanto (2013) who stated that the objectives of diagnostic assessment are to identify and to overcome students' difficulties in learning.

CONCLUSION

Based on the results and discussion above, it can be concluded that (1) the learning using Rally Coach-Schooly with diagnostic assessment is qualified towards the students' achievement of mathematical literacy ability, which can be seen from the validity of learning devices in the preparation stage, good category of the observation result of learning implementation and the positive students'

responses in the implementation stage, as well as the qualified evaluation result shown by the effectiveness of such learning towards the students' achievement of mathematical literacy ability, and (2) the diagnostic test results showed that both students with low and moderate mathematical literacy ability tend to have difficulties in relating the problems to the useful mathematical concepts for problem solving, while students with high mathematical literacy ability tend to be able to apply the mathematical concepts in problem solving but sometimes be careless in doing mathematical operations. Those difficulties can be overcome by peer tutoring and giving certain assignments based on students' difficulties so that their mathematical literacy ability can be developed. It can be seen from the final test result of the students who learned using Rally Coach-Schooly with diagnostic assessment that their average score was 74.58 and 88% of the students got higher scores than the minimal completeness criteria.

Development of students' mathematical literacy ability is supported by a learning which trains them to solve contextual problems. A learning using Rally Coach-Schooly with diagnostic assessment can be used as an alternative to promote students' mathematical literacy ability. The diagnostic assessment results of the VIII grade students with low, moderate and high mathematical literacy ability are different both their abilities and difficulties. It needs to be further explored the appropriate assessments to identify students' difficulties more specifically and follow-ups needed to overcome every student's learning difficulties more effectively by giving similar or other modified treatments.

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