Research Article

Development of android-based self-assessment application for basic pencak silat techniques

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Abstract: In Physical Education learning (PE), the absence of effective self-assessment to measure basic *pencak silat* techniques can hinder student learning and skill development. This research aimed to develop an Android-based self-assessment application for basic *pencak silat* techniques in PE classes. The study follows the Research and Development (R&D) method, incorporating the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation. Through expert validation and field trials at State High School 1 Bengkalis, the application's feasibility and effectiveness were assessed. Results showed a high level of feasibility and effectiveness, with significant improvement in students' understanding and skills in basic *pencak silat* techniques. The application offers benefits such as ease of use for teachers, increased student interest, and clear learning objectives. However, challenges include dependence on internet connectivity and device limitations. Despite limitations, this study contributes to innovative and efficient learning aids, enhancing skill assessment in PE. The implications extend to curriculum integration and improved assessment methods for teachers, empowering students to monitor their progress and enhance their skills independently. Future research could explore broader applications in sports learning and address specific needs in *pencak silat* education.

Keywords: self-assessment; *pencak silat*; physical education

1. Introduction

Physical Education (PE) in schools from elementary to high school encourages motor development, physical abilities, knowledge, reasoning, and appreciation of values, aids understanding of human movement and safety in movement, appreciates the benefits of physical activity for health, and promotes a healthy lifestyle for balanced growth (Ockta et al., 2024; Pitnawati et al., 2023; Umar, Ockta, et al., 2023). PE as one of the educational learning that must be taught in schools, which has an important role in the formation of human resources as a whole (Kryshtanovych et al., 2021; Li, 2021). PE is a process through physical activity in the form of physical activity that is designed and arranged systematically to stimulate growth and development, improve physical abilities and skills, intelligence and character formation, as well as values and positive for every citizen in order to achieve educational goals (Lundvall & Fröberg, 2023; Xing & Qi, 2023). The role of PE in schools is very important in the development of motor, cognitive, and affective skills (Klizine et al., 2023; Minghelli et al., 2023; Umar, Alnedral, et al., 2023). Through the learning process and PE development in schools, students are expected to gain experience that is closely related to motor motion learning (Fizi et al., 2023; Nanang et al., 2023). Basically, PE can improve the physical fitness of students, is the main purpose of physical education in schools by providing materials that stimulate children to move that have been arranged in the curriculum (Fizi et al., 2023; Peralta et al., 2020).

In the PE curriculum students are expected to have sufficient and adequate physical fitness, master at least one of the sports branches in the form of athletics, gymnastics, martial arts, swimming, basketball, football, volleyball, or other sports games (Glazkova et al.,

2020; Griban et al., 2020; Griggs & Fleet, 2021). So that students have the confidence to carry out sports activities regularly, have a healthy and active lifestyle because they are supported by adequate knowledge of physical education, technical and tactical regulations and sports strategies, inseparable from martial arts such as *pencak silat* (Bafirman et al., 2023; Damrah et al., 2023). *Pencak silat*, as a typical Indonesian martial art, is not only a sport, but also an important cultural heritage (Razak et al., 2022). Proposed as a compulsory subject in schools, *pencak silat* has great potential in building strong and ethical student character, as well as educating Indonesia's young generation as a whole (Kamal et al., 2023).

In *pencak silat*, there are character and cultural education values that can be developed in mental, martial arts, and sports aspects (J. P. Putra et al., 2023; Rahmawati et al., 2023; Sarbaitinil et al., 2023). *Pencak silat* is also passed down from one generation to the next generation which in the past when humans were still alive from hunting, they lived in groups and hostilely to maintain their lives, one of the kick techniques in *pencak silat* is the sickle kick (Yuki et al., 2023). *Pencak silat* is a movement of attack bela movements in the form of dance and rhythm with certain rules of politeness that can be performed in public. Silat is the essence of pencak, the science of fighting or defending yourself desperately that cannot be performed in public (Sazili et al., 2023). Through *pencak silat* sports, it is hoped that it will increase physical freshness, health, increase discipline character and to increase students' confidence and be more courageous to do sports regularly. *Pencak silat* is a martial art cultural heritage of the ancestors of the Indonesian nation to maintain their lives, humans always defend themselves from threats from nature, animals, and others who are considered to threaten their integrity. In PE learning, *Pencak silat* material has an important role. In it, students are expected to be proficient in the basic techniques of *Pencak silat*, which is an integral part of PE lessons (Bate'e et al., 2024; Setiaji et al., 2022). One of the skills that must be mastered is martial arts skills in *pencak silat*, students need to learn the basic techniques well and correctly first. Important basic techniques in *pencak silat* include T-kick techniques, straight kicks, sickle kicks, and punches. In martial arts there are seven basic techniques, including step patterns, attacks, stances, catches, tides, avoidance, and defense (Setijono et al., 2023).

Based on observations by researchers at State High School 1 Bengkalis in Juli 2022, regarding the implementation of basic techniques in *pencak silat*, many students face difficulties, especially in mastering these basic techniques. Basic techniques are considered the key to success in learning *pencak silat* because they affect students' abilities in the early, core, and late phases. A poor understanding of basic techniques, such as kicks, punches, deflections, and stance, is a major obstacle. Basic technique is very important because it helps maintain body balance, both in attack and defense (Irawan et al., 2021; Rahman et al., 2022). One of the reasons for teachers' difficulties in evaluating, improving, and supervising the basic technique skills of martial arts is the large number of students in one class, ranging from 25 to 30 students. This hinders the development of students' movement skills in basic techniques. A scaling, correcting, and supervising each student one by one becomes very difficult. However, it is important to correct motion errors promptly so as not to result in permanent motor errors, according to the theory of motion. One solution is to apply self-assessment to students. Through self-assessment, students can see the advantages and disadvantages for the next time these shortcomings become improvement goals (Han & Fan, 2020; Stančić, 2021; Yates et al., 2022). Thus, students are more responsible for the process and achievement of their learning goals, with self-assessment students are trained to assess themselves and identify their shortcomings and strengths to achieve a target in learning (Lyonga, 2022; Mahapoonyanont, 2020).

On the other hand, the rapid development of technology in this day and age can help humans in achieving maximum results in everything, especially in the field of sports (H. S. Lee & Lee, 2021; Robertson, 2020; Streimikiene et al., 2021). Sports activities can be supported and succeeded with technology in the field of sports (Aldenaini et al., 2020; Chembakottu et al., 2023; Collado-Mateo et al., 2021; Luo et al., 2021). Researchers are competing to develop new innovations because of the rapid development of technology

in the field of sports, one of which is technology often used in everyday life in finding various information with the help of data packages and the internet which is often called a smartphone, in a smart phone there is one operating system called Android (Khan et al., 2022; H. Lee et al., 2022). Android, as a Linux-based mobile operating system, is crucial in school learning because of the diversity of educational applications, easy access to learning resources, the ability to provide interactive learning, and its availability (Dirgatama et al., 2021). With these features, Android allows students and teachers to access learning materials flexibly, increasing learning motivation, and enriching the overall learning experience (Hakiki et al., 2024; L. S. A. Putra et al., 2024; Suartama et al., 2020).

Several previous studies have examined several aspects and developed various learning products for learning the topic of *pencak silat*. Some of these studies include the development of learning videos (Bate'e et al., 2024), learning management systems (Setiaji et al., 2022), and digital-based instruments (Damrah et al., 2023). However, studies that specifically develop self-assessment using Android technology are still difficult to find. Therefore, this research aimed to develop self-assessment applications in basic *pencak silat* techniques that will be carried out in high schools. The gap in this research is the lack of technology-based self-assessment tools for basic *pencak silat* techniques, which hinders the effective evaluation and improvement of students' skills in the context of current physical learning. The purpose of the *pencak silat* self-assessment application is to improve basic techniques, facilitate teacher evaluation, and encourage student independence.

2. Materials and Methods

The research method used in this study is Research and Development (R&D). The R&D method is an approach used to produce or perfect certain products, as well as test the effectiveness of those products (Sugiyono, 2016). This study aims to develop Android-based learning media by utilizing self-assessment applications on basic *pencak silat* Techniques material at State High School 1 Bengkalis. The research was conducted at State High School 1 Bengkalis, with research instrument trials on class XII students. The research was carried out in August 2022.

The research procedure follows the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The analysis stage includes an analysis of teacher needs in providing assessment and improvement of basic *pencak silat* techniques, as well as analysis of learning materials. The planning phase involves consultation with media and material experts, as well as designing learning scenarios. The development phase includes the production of self-assessment applications, validation by experts, and revision based on inputs. The implementation stage is the trial of the application to students, while the evaluation stage includes analysis of the results of application implementation and improvement of the model if needed.

The respondents of the study were class XII students at State High School 1 Bengkalis, with a total of 61 students. Research samples were taken from class XII IPA 3 as a control class and class XII IPA 4 as an experimental class, using simple random sampling techniques. The research instrument is a questionnaire of basic *pencak silat* techniques designed in accordance with relevant theories, then validated by experts. Data analysis was conducted using quantitative descriptive analysis, including tests of validity, reliability, and effectiveness of self-assessment applications. Instrument items are evaluated using the Likert scale, and the feasibility of the exercise model is assessed based on the feasibility percentage. Here are the details of the subject of this study presented in Table 1.

The validator team consists of martial arts experts, curriculum and material experts, test and measurement experts, and evaluation experts. Data collection methods include interviews, observations, and questionnaires. The data is then analyzed to determine the validity, reliability, and effectiveness of the self-assessment application, with the following formula (1). Furthermore, the level of effectiveness of self-assessment applications in basic *pencak silat* techniques is carried out by interpreting the calculation data using the criteria in Table 2.

Table 1. Research subjects

No	Experts	Sum
1	*Pencak silat* Experts	3
2	Curriculum and Material Experts	3
3	Test and Measurement Experts	3
4	Evaluation Experts	3

$$\text{Value Validity} = \frac{\text{Score Total}}{\text{Score Max}} \times 100\% \qquad (1)$$

Table 2. Effectiveness test criteria

No	Interval	Category
1	81-100	Highly Effective
2	61-80	Effective
3	41-60	Quite Effective
4	21-40	Less Effective
5	0-20	Ineffective

3. Results

3.1 Preliminary Research Phase

Research and development of Android-based self-assessment applications is carried out on the basis of needs analysis consisting of several points. First, PE subjects require a theoretical and practical approach, so creative and innovative media are needed to achieve learning objectives, especially in two meetings per semester. Second, adolescent learners are very familiar with technology and social media, so that electronic-based learning is easier for them to understand and apply. Furthermore, needs analysis also involves determining the location of research in accordance with the identified problems and selecting the right material for the development of self-assessment applications. Another factor is that most learners have a mobile / Android device or even a laptop, which can be used to access self-assessment applications. This is a potential that can be utilized to increase the effectiveness of teaching and learning activities.

School selection was based on preliminary research through interviews with PE teachers at State High School 1 Bengkalis. From the interview, it was revealed that the learning problem in the school was the lack of adequate learning media, so an Android-based self-assessment application was needed to help students assess themselves and improve their discipline and learning outcomes. Initial observations also show that most students are less active in learning, so the self-assessment application is expected to help teachers assess the learning ability of each student individually. The material chosen for the development of this application is the basic technique of martial arts, because many students have not mastered it and teachers have difficulty in assessing their abilities individually. Thus, the development of this Android-based self-assessment application aims to improve the effectiveness of Physical Education, Sports, and Health learning at State High School 1 Bengkalis by utilizing the potential of technology owned by students.

3.2 Planning Phase

In the planning stage of research on the development of Android-based self-assessment applications, the steps taken are as follows, First, material collection on basic *pencak silat* techniques was carried out from sources such as the latest Ministry of Education and Culture Physical Education, Sports, and Health books, as well as several journals related to the material. Second, a draft material was made on the basic techniques of martial arts that will be assessed in an Android-based self-assessment application. Next, the third stage is to design and create an Android-based self-assessment application using the

JotForm platform. The fourth step involves preparing the additional materials needed to create such a self-assessment application on JotForm. Finally, the fifth stage is to validate the application using a questionnaire evaluated by four expert validators. The validators consist of martial arts experts, measurement experts, evaluation experts, and material curriculum experts. With this planning stage, it is expected that the development of Android-based self-assessment applications can run systematically and meet the desired quality standards.

3.3 Product Development Stage

The development results of the Android application developed in this study are presented in Figure 1. On the initial page of the self-assessment application, there is a school logo and student identity that will be filled in by each student who will use the Android-based self-assessment application (Figure 1a). On the video page Basic *pencak silat* techniques Android-based self-assessment application there is a video of basic *pencak silat* techniques to be able to watch students before doing basic *pencak silat* techniques (Figure 1b). Furthermore, on the assessment page Basic *pencak silat* techniques for developing Android-based self-assessment applications, are assessment statements that must be answered by every student with the yes/no answers (Figure 1c). On this page students are asked to upload videos of each basic *pencak silat* technique on youtube then share the video link on the pool that has been determined (Figure 1d). The final page after uploading the video. The basic techniques of *pencak silat* are shown by the notification that the video was successfully uploaded on the Android-based self-assessment application (Figure 1e).
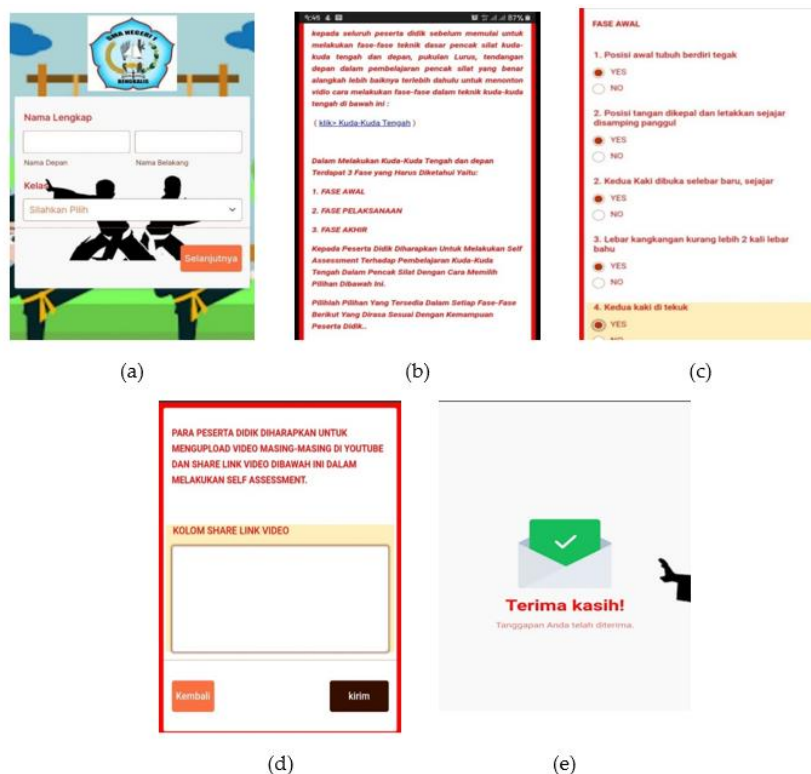

Figure 1. Android-based self-assessment application: (a) start page, (b) video page, (c) assessment page), (d) upload page, and (e) submitted successfully page

3. 4 Limited Field Test Phase

Based on the results of limited tests by experts, the development of an android-based self-assessment application for basic *pencak silat* techniques at State High School 1 Bengkalis is considered very feasible to use. The validation results from martial arts experts showed a percentage score of 88.95%, which was in the "very feasible" category according to the rating scale used. Comments and suggestions from martial arts experts include improvements to basic techniques to be better understood by learners and detailed questions

to improve focus on answering. Furthermore, from the results of measurement expert validation, a percentage score of 83.33% indicates that this application is considered "feasible". Suggestions from measurement experts include improving the sentence of the statement for clearer measurement objectives and detailing the question to improve focus in answering. The evaluation expert gave a percentage score of 90.38%, which also falls into the "very decent" category. Suggestions from evaluation experts include improving statement sentences to ascertain what the app can evaluate, as well as detailing questions to improve students' focus on answering.

Finally, the validation results from curriculum experts showed a score percentage of 93.05%, also included in the "very decent" category. Suggestions from curriculum experts include correcting statement sentences to ensure achievement of curriculum objectives using this application, as well as question details to increase learners' focus in answering. The feasibility level of the self-assessment application obtained from the validation test stage by martial arts experts, measurement experts, evaluation experts, and curriculum experts is shown in the Figure 2.
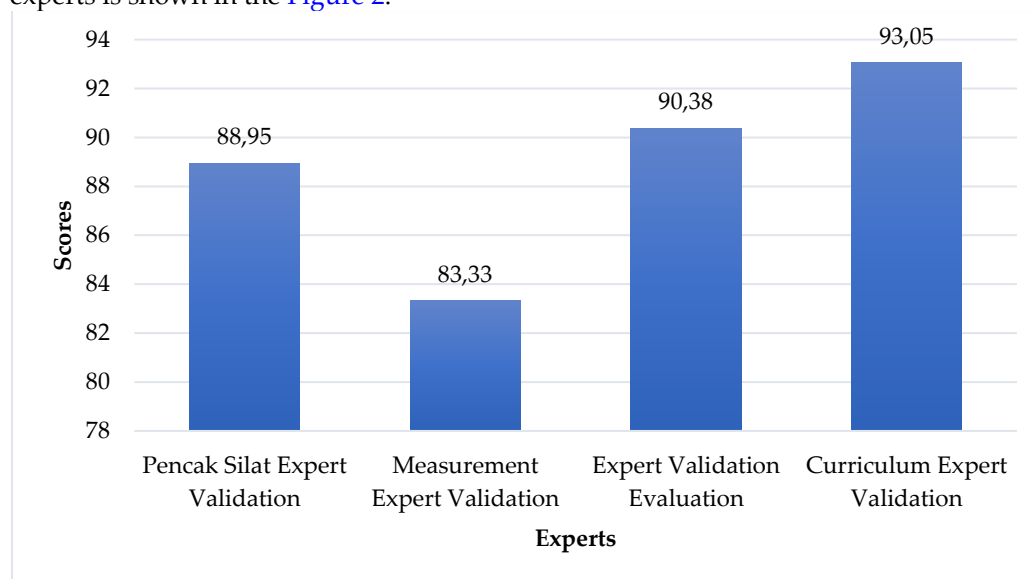

Figure 2. The average of expert validation results

3. 5 Evaluation

This stage is a product trial. Self-assessment applications that have been developed in addition to applications with the subject matter of basic *pencak silat* techniques. Product implementation is carried out from November 15 – December 15, 2022 at State High School 1 Bengkalis. The trial of this product was carried out by researchers in 1 stage. The results of the first phase of the self-assessment application trial were obtained from the results of using the self-assessment application. Data on application trials is obtained from the use of self-assessment applications used. Table 3 is the results of Teacher trials using self-assessment applications.

Table 3. Result of PE Teacher using self-assesemt applications

Respond	Statement										Total
	1	2	3	4	5	6	7	8	9	10	
PE Teacher	4	4	3	3	4	4	3	4	3	4	36
Percentage											90%

From the results of the trial of using an android-based self-assessment application on basic *pencak silat* techniques for State High School 1 Bengkalis students obtained 90% results. So it can be seen that the use of self-assessment applications has a category of very good because it is at a percentage of 86% - 100% with the results of descriptive analysis.

3. 6 Design Improvement Phase Limited Field Test Results

Comments and suggestions obtained from small-scale trials from experts, teachers and also learners will then be improved as suggested.

3. 7 Wider Field Trial Phase

After small-scale field trials, large-scale field trials will be carried out consisting of 31 experimental class people and 30 control class people in class XI IPA State High School 1 Bengkalis. The data obtained from wide-scale field trials obtained a value of 90% with a very feasible category using descriptive analysis.

3. 8 The Effectiveness of Android-Based Self Assessment

The effectiveness of the self-assessment application developed can be seen from the results of the ability test of basic martial arts techniques. The results of the analysis on the effectiveness test with experiments (t test with a significant level (α) = 0.05) on the Android-based self-assessment application of basic *pencak silat* techniques show that the application is effective in improving the ability of basic *pencak silat* techniques (Table 4). This is seen from the difference between the results of the basic *pencak silat* technique experimental class and the control class. Where the experimental class is a class that uses an android-based self-assessment application, basic *pencak silat* techniques, and the control class does not use an android-based self-assessment application, basic *pencak silat* techniques. Where the android-based self-assessment application of basic *pencak silat* techniques has a greater influence on the ability of basic *pencak silat* techniques.

Table 4. Effectiveness test results

Group	Samples	The Total Value of Basic *Pencak Silat* Techniques	Average Score	Category
Experimental	31	1278	41,23	Effective
Control	30	686	22,87	Less Effective

4. Discussion

Through the development of Android-based self-assessment applications, it is hoped that students can be more active in exploring, discovering, and utilizing learning materials so that learning objectives can be achieved optimally. This is in line with research conducted by (Subarkah, 2021) Android smartphone-based assessment learning is effective because it makes it easier for students to get learning materials along with schoolwork and makes it easier for teachers to provide learning materials, schoolwork, and can assess students. By adopting the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. The results of observations show that in movement assessment, especially in the context of basic *pencak silat* techniques, teachers only use subjective assessment without using tools such as assessment applications. The next step is to design an android-based self-assessment application for basic *pencak silat* techniques, using a platform called "Jotform" as the main medium. Use JotForm for online form creation with integration, scheduling, online payments, data analysis, and high-security features for a variety of business and organizational purposes (Arumugam et al., 2024).

After designing the application, researchers validate by experts, including martial arts experts, measurement experts, evaluation experts, and curriculum experts. The validation results show that this application is feasible to use, with the feasibility percentage ranging from 83.33% to 93.05%, which shows that this application meets the expected quality standards. After obtaining good validation, the application is ready to be tested at a later stage. In the field trial stage, this application was implemented in learning basic *pencak silat* techniques at State High School 1 Bengkalis. The results of the trial showed that this application was effective in improving students' understanding and skills in basic *pencak silat* techniques. The experimental class that used the self-assessment application

showed significant improvement compared to the control group that did not use this application. Android-based self-assessment apps for basic *pencak silat* techniques have proven to be effective, with significant improvement in student abilities and positive feedback from teachers and experts.

Some of the advantages of this self-assessment application include ease of use for teachers in evaluating students, increased interest in learning students, clear learning objectives, and the ability of students to assess themselves. Self-assessment in sports learning improves accessibility, and self-efficacy while promoting academic integrity and motivation (Pascual & Ruiz, 2018). This is supported by research conducted by Ihsan et al (2024) that self-assessment applications are needed to help individuals assess their strengths and weaknesses, monitor progress, and identify areas for improvement, thus supporting self-development more effectively.

However, there are also some disadvantages to note, such as dependence on an internet connection, limitations in the types of devices that can be used, and the need for a stable network. Although this application has been declared feasible and effective, this research has several limitations, such as only conducting research in one school, limitations at the assessment stage that only reaches expert validation, and limited time in class hours for basic *pencak silat* technique material. Nevertheless, this research makes an important contribution in the development of innovative and effective learning aids in the context of basic *pencak silat* techniques.

5. Conclusions

Research and development of an Android-based self-assessment application for basic *pencak silat* techniques in learning has contributed significantly to the world of education, especially for teachers and students. This application is not only a tool in the teaching and learning process, but also opens up new opportunities in assessing students' skills more objectively and efficiently. From the results of the study, it can be concluded that this self-assessment application shows a high level of validity, supported by a strong level of reliability. The results of validation by experts and a high level of effectiveness are proof that this application is suitable for use in the learning environment of basic *pencak silat* techniques.

The implications of this self-assessment application can be integrated into the curriculum as one of the innovative learning methods, not only for *pencak silat* but also for other fields that require direct skill assessment. Then, in the context of teachers, this application becomes a useful tool to improve the effectiveness of assessment of students' abilities in basic *pencak silat* techniques. This can provide significant assistance for teachers in providing more detailed and in-depth feedback to students. The existence of this self-assessment application has a positive impact on learning and developing their skills in martial arts. They can use the app as a tool to monitor their own progress, as well as a means to increase independence in exercises outside of school hours. This can help improve their achievements in *pencak silat* sports, both in the school environment and in competitions outside of school.

Further research can be done to develop this application into other aspects of *pencak silat* or even other sports. A deeper understanding of the needs and challenges in learning *pencak silat* can help researchers develop applications that are more effective and in accordance with user needs. In addition, research can also be extended into broader contexts, such as the use of technology in sports learning in general, to make a greater contribution to the future development of education and sport.

Conflicts of Interest: The author states there is no conflict of interest.

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