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Development of Learning Media Using Smart Apps Creator Based on Local Wisdom in Work and Energy Materials

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Abstract: Technology-based learning media in this era's education field is essential to deliver more exciting and interactive learning that can be linked to local wisdom. This research aims to describe the validity, practicality, and effectiveness of learning media using SAC based on local wisdom on the material of work and energy in 10th grade of SMA Negeri 1 Tinangkung and SMA Negeri 2 Tinangkung. This research uses the development of ADDIE Models. The namely obtained the average percentage validation results for media of 96.67% and material of 96.69% and is in the very valid category, the practicality of learning media used with an average percentage of assessment for small classes of 91.47% and large classes of 97.68% with a very good predicate. The average assessment percentage for learner responses in small classes is 94.46%. In contrast, for large classes, it is 87.14%. The effectiveness of learning media for learner activity observation sheets in small classes is 100%, and in large classes is 99.78%, with a very good predicate. For learning outcomes in the small class, N-Gain was 0.98 with a high category, and the extended class was 0.965 with a very high category.

Keywords: Learning Media; SAC; Local Wisdom; Work and Energy.

Introduction

According to UUD number 20 of 2003, Article 1 regarding the National Education System articulates that education constitutes a deliberate and organized endeavour aimed at establishing a conducive environment and structured process for students to proactively unfold their potential in religious, spiritual, self-disciplinary, personality, intellectual, virtuous moral, and skill domains essential for individual, societal, national, and state well-being. Article 4 further details the responsibility of educators and education personnel to foster an educational environment characterized by meaning, enjoyment, creativity, dynamism, and open dialogue. Therefore, education in schools must be carried out as well as possible to obtain maximum results (Nasional, 2003).

Currently, the world is facing the fifth industrial revolution (Industry 5.0) in various fields, one of which is education. The development of education has experienced relatively rapid changes. This transformation includes integrating technology into the current education sector (Rizki et al., 2022).

Technology-based learning media in the education sector, especially in this era, is critical to delivering learning material to participants that is more interesting and interactive so that the presence of technology can appropriately penetrate space and time limitations in improving the quality of learning (Saade et al., 2012; June et al., 2014; Frohberg et al., 2019; Parker, 2020). The development of technology-based interactive learning media will likely increase students' interest in physics lessons and understand the discussion topics presented by the teacher so that students' learning outcomes improve (Khasanah & Rusman, 2021; Rahim et al., 2020; Muliyati et al., 2020; Dasilva et al., 2019; Chasani & Yennita, 2019).

Interactive learning media is a learning media that can convey information from teachers to students by utilizing technology in the form of applications as

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educational media (Puspitarini & Hanif, 2019; Dasmo et al., 2020; Gan et al., 2015. Smart Apps Creator is a software tool that generates educational content tailored for Android platforms. Smart Apps Creator (SAC) is a desktop application that makes interactive media that can produce output as APK files (Khotimah et al., 2023; Latif & Utaminingsih, 2021; Muzakkir et al., 2022; Fahlevi & Aminatun, 2023).

Physics learning will be more meaningful if there is continuity between the subject's content and the everyday activities within the students' living environment, which is used as a learning tool and resource (Setiawan et al., 2023; Amali et al., 2023; Jumadi et al., 2021). One way for students to easily understand physics concepts and principles is to relate them to local wisdom often encountered (Fitriah et al., 2021). Therefore, local wisdom is applied by teachers in delivering material so that students can well receive it. The nation's character and culture aim not only for students but also for teaching staff to be more creative and innovative and further develop their abilities (Sulianti et al., 2019).

Based on observations and interviews conducted on the Physics learning process at SMA Negeri I Tinangkung and SMA Negeri 2 Tinangkung, where teachers still do not use learning media variedly and maximally, there is a lack of application of local wisdom in learning, students feel that physics lessons are difficult to understand, and Many students have smartphones. Still, most of them are used to play games. Based on the problems above, efforts are needed to improve learning by selecting appropriate and interactive learning media. One learning method that can improve the quality of learning processes and outcomes is developing learning media using SAC based on local wisdom (Qomariyah & Pertiwi, 2023).

This research was conducted to continue previous research titled Student Responses to SAC Learning Media Based on Local Wisdom of the Jepara Mantingan Mosque to Improve Understanding of Building Concepts in Elementary Schools. This research produced a learning media product based on Android SAC suitable for use and implementation. This research can be further developed by developing learning media using SAC based on local wisdom to enable students to understand work and energy material (Ali & Zaini, 2023; Mulatsih et al., 2023; Eviyanti et al., 2022).

Based on the background that has been explained, the researcher researched the development of learning media to increase students' interest in learning by formulating the title "Development of Learning Media Using SAC Based on Local Wisdom in Work and Energy Materials."

Method

The research was conducted in the even semester of the 2022/2023 academic year in class X MIPA at SMA Negeri 1 Tinangkung and SMA Negeri 2 Tinagkung, Banggai Islands Regency, Central Sulawesi Province.

This research is a type of research and development known as Research and Development (R&D), a research model used to produce specific products and test the effectiveness of these products (Sugiyono, 2010). The development model used is the ADDIE model. ADDIE is an abbreviation for Analysis, Design, Development, Implementation, and Evaluation. Much research into developing learning models and learning media uses the ADDIE model in Figure 1 (Muslimin et al., 2017).

Figure 1. Flow chart of research

The investigation into crafting Learning Media with SAC based on local wisdom employs the ADDIE development model. This study's developmental process of learning media follows the ADDIE model, encompassing five stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was chosen because it suits the needs of researchers, namely developing learning media using SAC based on local wisdom. Development-type research prefers to use the ADDIE model because it produces products and helps improve student learning outcomes (Widyastuti & Susiana, 2019).

Data collection techniques and data collection instruments used include validation by experts (media experts, material experts, technology experts) using validation sheets, observation (implementation of learning and student activities) using observation sheets, student responses to Learning Media Development Using SAC based on local wisdom using questionnaires and participant learning results carried out before and after the educational process utilizing learning materials created with SAC based on local wisdom which was developed on work and energy material through test sheets (posttest and pretest). The methodology employed for data analysis in this study is

descriptive analysis. This approach elucidates the outcomes of scrutinizing expert validation of learning materials, delineates students' engagement in the learning process, and assesses their knowledge development through testing. This data analysis technique consists of media validation data analysis, media practicality analysis, and media effectiveness analysis.

Media Validation Analysis

The learning of media validation analysis technique is carried out using qualitative descriptive analysis, namely the average score of the assessment of learning tools from the validators and converted to the criteria as in Table 1 (Budiarso, 2017).

Table 1. Validity Criteria for Learning Media

Score Intervals	Assessment criteria	Information
3.6 ≤ P< 4	Very Valid	It can be used without revision
2.6 ≤ P< 3.5	Valid	It can be used with minor revisions
1.6 ≤ P< 2.5	Less Valid	It can be used with multiple revisions
1.0 ≤ P< 1.5	Invalid	It is not yet usable and still requires revision

Media Practicality Analysis

The learning of data analysis practicality median using SAC based on local wisdom in terms of the execution of learning and the reactions of students to the educational materials. The subsequent formula is applied to gauge the effectiveness of the complete learning procedure in equation (1). Data from student response surveys concerning the utilization of the developed educational materials was assessed through a Likert Scale in Table 2 (Sukardi, 2013).

$$Implementation\ (\%) = \frac{Number\ of\ steps\ completed}{Number\ of\ planned\ steps}\ x\ 100\% \quad (1)$$

Table 2. Likert scale

Position Statement	SA	A	DA	SD
Positive Statements	4	3	2	1
Negative Statements	1	2	3	4

Information for SA is strongly agree, A is agree, DA is don't agree, and SD is strongly disagree. Measuring the results of student response data uses the following in equation (2). The criteria for the percentage of student activity can be interpreted in Table 3 (Sukardi, 2013).

$$Response\ (\%) = \frac{The\ total\ score\ of\ all\ respondents}{Ideal\ score}\ x\ 100\% \quad (2)$$

Table 3. Learning Implementation Criteria

Value Range (%)	Interpretation
86 - 100	Very good
75 – 86	Good
66 – 75	Enough
56 – 65	Less
0 – 55	Not much

Media Effectiveness Analysis

Data analysis of the effectiveness of SAC learning media based on local wisdom on work and energy material is viewed from two aspects, namely student activities and learning outcomes tests. The results of observations of student activities were analyzed using equation (3). The criteria for the percentage of student activity can be interpreted in Table 4 (Sukardi, 2013).

In this research, test analysis of learning outcomes is obtained by calculating test results to determine students' completeness and will also be analyzed through the N-Gain test. The following equation is used to get the N-Gain value in Equation (4) (Sukardi, 2013), where for $< g >$ is Gain Score, *Si* is Initial test average, and *Sf* is Final test average. The magnitude of the $<g>$ factor can be seen in Table 5 (Hake, 1999).

$$Student\ Activities\ (\%) = \frac{Total\ score\ obtained}{Maximum\ score}\ x\ 100\% \quad (3)$$

Table 4. Criteria for Student Activities

Value Range (%)	Interpretation
86 – 100	Very good
75 – 86	Good
66 – 75	Enough
56 – 65	Less
0 – 55	Not much

$$< g > = \frac{\%<G>}{\%<G>\ max} = \frac{(\%<Sf> - \%<Si>}{(100 - \%<Si>)} \quad (4)$$

Table 5. Gain Value Criteria

Value	Classification
(<g>) ≤ 0.3	Low
0.3 < (<g>) < 0.7	Medium
(<g>) ≥ 0.7	High

Result and Discussion

Result

Development of learning media using SAC based on local wisdom in work and energy materials at SMA Negeri 1 Tinangkung and SMA Negeri 2 Tinangkung. This research uses R&D research with the ADDIE development model aims to produce a product, namely

learning media using SAC, based on local wisdom on quality material that is valid, practical, and effective.

Analysis

The analysis stage is the initial stage of ADDIE development. Activities carried out at this stage include needs analysis by detecting the initial conditions of the learning media created by the teacher and the expected final results by determining the basic principles needed in developing learning media. After that, an analysis of local wisdom in the Banggai area was carried out and integrated into the learning media designed and related to work and energy material. Some local wisdom that is related to work and energy is Babose (rowing using a canoe), Batotimpa (fishing), Batatabua (beating the drum), Balongot Boyis (Carrying a traditional basket from the Banggai Islands) and Bapidok (Planting Banggai yam). Then, students are analyzed based on ethnic background, parents' occupation, and students' academics. After that, content analysis was carried out, and finally, the SAC feature was analyzed.

Design

The second stage is media design. Activities include compiling or formulating learning objectives, collecting content (video or photos), creating teaching media displays using Canva, and designing features using PixelLab.

Development

During the developmental phase, the objective is to create a viable product, namely educational materials utilizing SAC, grounded in local wisdom, which is then subjected to validation by an expert team. The provided recommendations are utilized to enhance the developed learning materials. Learning media using SAC, which was developed before the media was tried out in schools, was validated by a team of experts (validators) first through a Focus Group Discussion (FGD), which was held on Friday, 16 June 2023, consisting of 3 lecturers from the Postgraduate Physics Study Program Gorontalo State University. Validity assessment by validators in the development of learning media using SAC based on local wisdom on work and energy material is carried out by media experts who cover technical quality aspects and material experts who cover aspects of content quality and objectives as well as instructional quality which can be seen in Table 6.

Table 6. Percentage of validation of SAC learning media based on local wisdom

Validator	Aspect	Percentage (%)			Category
		Validator 1	Validator 2	Validator 3	
Media Expert	Technical Quality	96.67	96.25	97.50	Very Valid
Materials Expert	Quality of Content and Purpose	93.33	97.92	100	Very Valid
	Instructional Quality	88.89	100	100	Very Valid

Table 6 shows that the average percentage value reached 96.67%. Thus, based on Pitaloka et al. (2023), the interval 85.01% to 100% is very valid, so that media expert validation is very valid and is very suitable for use. For the material expert analysis results, the overall average reached 96.69%, so the material expert validation was declared "Very Valid".

Implementation

This is the implementation stage of learning media developed to be applied in schools. At this stage, limited and extensive trials are carried out using learning media that the validator has validated. Little tests were carried out at SMA Negeri 2 Tinangkung with 14 students, while widespread tests were carried out at SMA Negeri 1 Tinangkung with 29 students. Based on the trials that have been carried out, the results of the practicality and effectiveness of learning media can be described as follows.

Practicality of Learning Media

The practicality of using wisdom-based SAC media in the learning process on work and energy material is reviewed from the results of implementation data during three meetings, and the effects of student response data obtained in the limited trials and extensive trials carried out.

Illustrates the percentage outcomes of the learning implementation during the limited trials conducted over three meetings in Figure 2. Figure 2 shows the implementation of limited trial learning, which was carried out based on the results of 2 observers, namely the physics teacher at SMA Negeri 2 Tinangkung, one person, and the physics teacher at SMA Negeri 1 Tinangkung, one person.

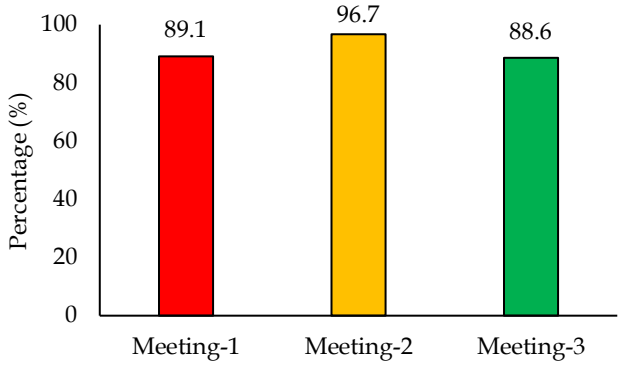

Figure 2. Percentage Results of Learning Implementation in Limited Trials.

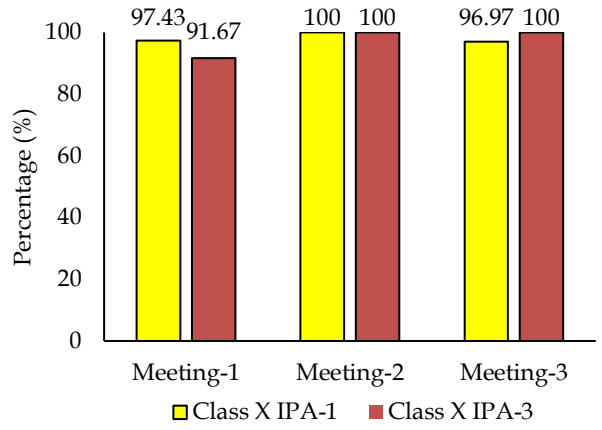

Figure 3. Percentage Results of Learning Implementation in Widespread Trials

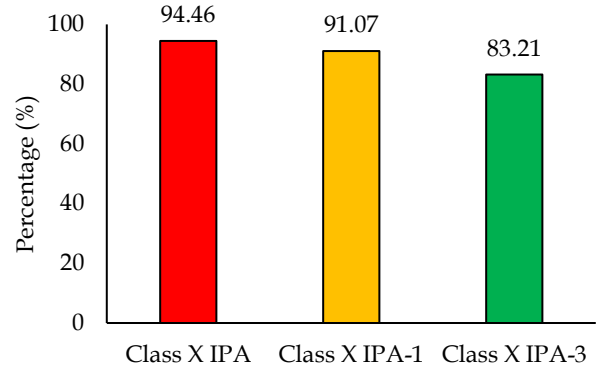

Figure 4. Percentage of Student Responses in Limited Trials and Widespread Trials

In Figure 2, the average percentage obtained at each meeting was 89 for the first meeting. 1%, the second meeting was 96.7%, and the third meeting was 88.6%. In general, observations of learning implementation have the criteria "Very Good." Extensive trials carried out in class X IPA-1 and class X IPA-3 in Figure 3.

Based on Figure 3, the average percentage of implementation of learning in the trial extends to each meeting, namely for class IPA. The first, three meetings 91.67%, the second 100%, and the third 100%. In general, observations of learning implementation have the criteria "Very Good."

The practicality of learning is also reviewed from students' responses to using SAC learning media based on local wisdom in work and energy material in the classroom. Results of the percentage of student responses to SAC learning media based on local wisdom based on a response questionnaire distributed in a limited trial of 14 students in class X Science SMA Negeri 2 Tinangkung and a more comprehensive trial of 15 students in class at SMA Negeri 1 Tinangkung which has been taught with learning media using SAC media based on local wisdom. This questionnaire was distributed after all learning activities, namely the first and third meetings, and the learning outcomes test was carried out, as shown in Figure 4.

Figure 4 shows that the results of the student response questionnaire to the SAC learning media based on local wisdom in class X IPA were 94.46%, class X IPA-1 was 91.07%, and class If averaged, it reached 89.58%. The results of the student response questionnaire have the criteria "Very Good" and are practical for use in classroom learning.

Media Effectiveness

The effectiveness of learning media using SAC based on local wisdom can be seen through two aspects, namely, student activities and student learning outcomes. The results of student activities in Figure 5.

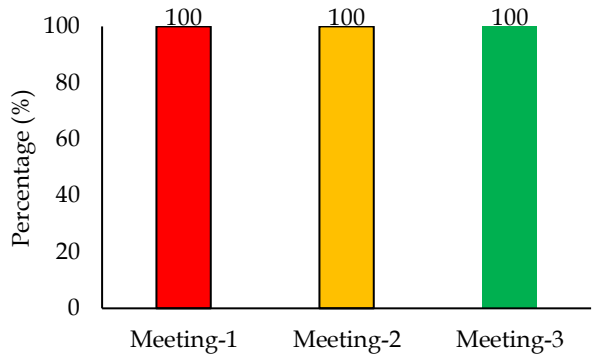

Figure 5. Percentage of Student Activities in Limited Class Trials

About graph in Figure 5 provide two statements. First, the percentage results obtained from student activities from the first meeting to the third meeting in a row in limited class trials: the first meeting was 100%, the second meeting was 100%, and the third meeting was 100% and thus can be interpreted " very good".

The outcomes of student activity percentages, as observed throughout the learning process during three meetings in the comprehensive trial in Figure 6.

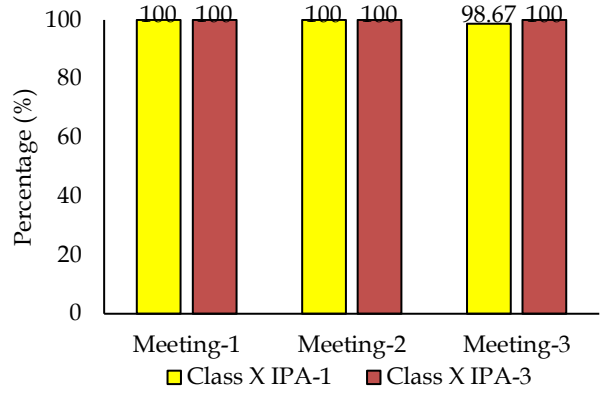

Figure 6. Percentage of Student Activities in Expanding Trials.

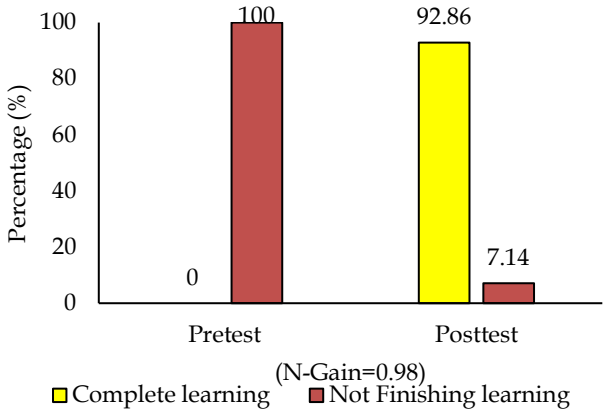

Figure 7. Average Score and N-Gain in Limited Trials.

Figure 6 shows the percentage of student activity in the trial extending over three meetings in the learning process, which has a percentage from the first meeting to the third meeting in a row, namely class the third was 98.67%. Second, student learning outcomes can be seen after a learning outcomes test in this study were divided into two: pre-test and post-test. The overall test results of students in the limited pre-test and post-test can be seen in Figure 7.

Based on Figure 8, the average score of learning outcomes through pre-test and post-test obtained through tests taken by students has an N-Gain > 0.7 with the description "High" and classically has 92.86% completeness. This makes the researchers conclude that the media is suitable for testing large groups without revision.

After a limited trial was carried out without revision, it was continued with an expanded practice. The results of the N-gain score obtained can be seen in Figure 8. Figure 8 shows that the pretest for class offers an increase that can be seen in the N-Gain analysis with a high interpretation of 0.93, while the N-Gain results obtained in the student learning outcomes test in class Student learning outcomes are 100%. Figure 2 shows increased students' learning completeness based on the Minimum Completeness Criteria 75. The percentage score of students' fullness in class X IPA 1 and class X IPA 3 can be seen in Figure 9.

Figure 9 shows the percentage of completeness of student learning outcomes based on the Minimum Completeness Criteria 75. There was an average score of students' completion percentage in class X IPA 1 and class X IPA 3 on average: 96.67% of students completed and 3.34% did not.

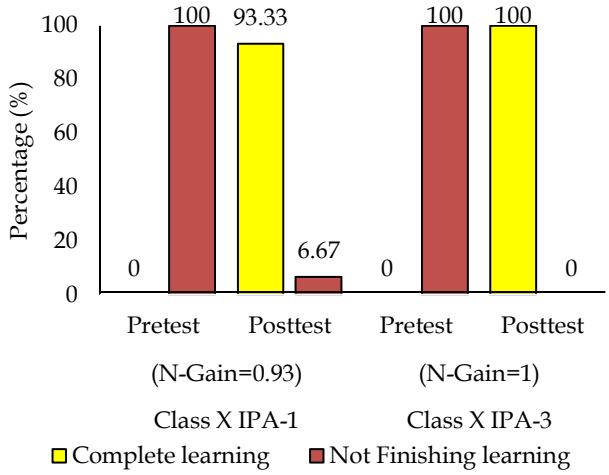

Figure 8. Average Score and N-Gain in Expanded Trials.

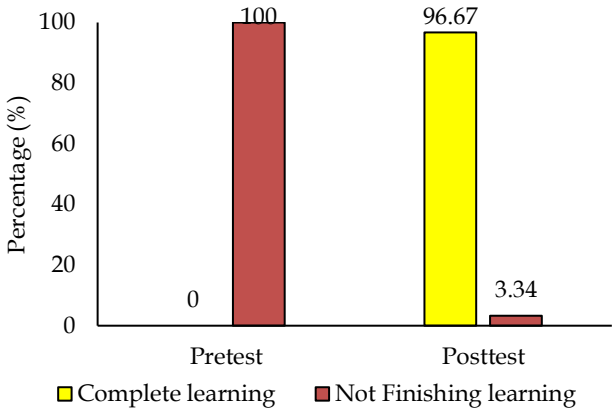

Figure 9. Percentage of Student Completion.

Evaluation

This phase is conducted to evaluate the outcomes of learning media development. It involves two approaches: formative evaluation and cumulative evaluation. Formative evaluation is conducted after each lesson, while cumulative evaluation is carried out at the end (three meetings). This evaluation stage aims to provide feedback to students and then revise them as needed.

Discussion

This research aims to produce learning media products using SAC, based on local wisdom on quality

work and energy materials that are valid, practical, and effective.

Validity of SAC Learning Media Based on Local Wisdom

The validity assessment stage is carried out to validate the research instrument, namely, learning media assessed by experts/validators. Validity assessment is carried out through focus group discussion (FGD) by presenting validators (experts) and supervisors to produce improvements based on suggestions and input for the validity of the learning media used. FGD sessions are conducted to enhance the initial product and establish the viability of the learning materials employed in the study. Following the completion of FGD, the learning materials are evaluated by distributing a validation sheet to the validators. The validation outcomes from both media and content experts indicate a high level of validity for the learning materials. For validator 1, validator 2, and validator 3, respectively, 97.50% and 96.88%, 96.25% and 97.92%, and 96.25% and 97.92%. Based on these results, it is stated that a media can be used because the results of expert validation show that all learning media are classified as very valid criteria.

Practicality of SAC Learning Media Based on Local Wisdom

The practicality of the learning media developed in this research was obtained through observing the implementation of learning and student responses. Implementing education using SAC (SAC) learning media based on local wisdom was carried out in three meetings, with a pretest carried out before treatment using SAC learning media based on local wisdom. The posttest was carried out at the end of the learning after treatment, and observers observed the learning implementation during the learning process.

The pretest is carried out at the beginning of learning before being given treatment, namely for class X IPA, class X IPA 1, and class X IPA 3. The test given is a description test consisting of 5 questions. The pretest is conducted to see students' initial work and energy material abilities. Next, the pretest results are analyzed based on the achievement scores of each student.

The results of the percentage of learning implementation carried out in three meetings with the results obtained for class The results for class X Science 3 were the first meeting with a percentage of 91.67%, the second meeting with a percentage of 100%, and the third meeting with a percentage of 100%. Thus, the average percentage of learning implementation for all meetings in class X Science 1 is in an efficient interpretation, namely 98.13%. Likewise, class X IPA 3 is in an efficient interpretation, namely 97.22%. This shows that the activities were carried out well even though some things still needed to be carried out. Activities that could not be carried out in the learning process during three meetings for class X Science 1 and class X Science 3 were the core and closing activities. In the primary and closing parts, not all groups presented the results of their discussions. This is due to insufficient learning time and students being slow in answering questions on the student worksheet.

Student response questionnaires are given at the end of the entire learning process using the SAC learning media based on local wisdom that was developed. Each student is asked to answer questions about using the learning media in this questionnaire. All students answered based on a Likert scale. Student responses to learning media developed in class X IPA 1 obtained a score of 510 out of 560, so the response percentage of students in class X IPA1 was 91.1% or very good. Next, students' responses to the learning media developed in class X Science 3 obtained a 466 out of 560, so the percentage of student responses in class X IPA1 was 83.2% or good.

The analysis of student responses shows that most students responded positively to learning media using SAC based on local wisdom, which has been implemented even though the learning media used is something new for them. This means that by implementing SAC learning media based on local wisdom, you will get an excellent response to the learning media implemented (Latif & Utaminingsih, 2021).

Effectiveness of SAC Learning Media Based on Local Wisdom

The efficacy of the developed learning materials can be assessed by utilizing student response surveys and tests measuring student learning outcomes. Student activities are observed to ascertain the effectiveness of the SAC learning materials created and implemented in the learning process. Observations of student activities are carried out during the learning process, and students' activities are assessed by matching the results of the average total score obtained.

The percentage of overall student activity from three meetings using the SAC learning media shows the results of observing student activity for class X IPA 1. At the first meeting, it was 100%. At the second meeting, it was 100%, and at the third meeting, it was 98.67%, so the average percentage of student activity was 99.56% from all meetings in this class. Class X IPA 3, at the first meeting, it was 100%. At the second meeting, it was 100%, and at the third meeting, it was 100%, so from all meetings in this class, the average percentage of student activity was 100%. Both classes meet the criteria very well. Following observations of student activities, the actions that students should have carried out were due to inadequate networks accessing learning media.

The description test is analyzed based on the achievement of minimum completeness, which can then be used to calculate the percentage of student learning completeness and increase student learning outcomes using N-Gain. Completion analysis aims to find out the percentage of students' completeness on the multiple-choice test that has been given. Based on the research in the assessment of learning test results it shows minimum completeness results from class X IPA 1 students, totaling 15 people with minimum completion criteria. Fourteen students completed it, and one student still needs to end. Furthermore, the minimum completeness results from class X IPA 3 students totaling 14 people with minimum completion criteria all completed. So, the average percentage obtained in class X IPA 1 was 93.33%, and in class X IPA 3 was 100%. Thus, the percentage of students' learning outcomes test completion is an excellent interpretation.

The results of N-Gain in the learning outcomes test for class X IPA 1 students for the pretest was 0%, and the posttest was 93.33% with an N-Gain interpretation of 1 high category. Furthermore, the results obtained by N-Gain in the student learning outcomes test in class X IPA 3 for the pretest is 0%, and the posttest is 100% with an N-Gain interpretation of 1 high category. The completeness of the learning outcome indicators shows the application of learning media development using SAC based on local wisdom in helping complete student learning outcomes on work and energy material. This concludes that learning physics using an inquiry model on heat material can improve student learning outcomes (Syarifuddin et al., 2020). The SAC application is one software that can support the design of smartphone-based learning media (Adam et al., 2023). By utilizing the ecological and cultural potential of the community, local wisdom can be used as a learning resource (Orab et al., 2023). Based on the explanation, learning about work and energy material using SAC learning media based on local wisdom positively affects student learning outcomes.

Conclusion

Based on the results of ADDIE development research, it can be concluded that the results of the validation carried out by three validators obtained an average percentage for media of 96.67% in the very valid category and for material of 96.69% in the "Very Valid" category. Meanwhile, the results of the practicality of learning media are seen in the implementation of learning and student responses. The implementation of learning for small classes was 91.47%, and for large classes was 97.68% with the title "Very Good." The average percentage of assessments for student responses in small classes was 94.46%, while for large classes, it was 87.14% with the criteria "Very Good." Furthermore, the effectiveness of the learning media used for student activity observation sheets in small classes was 100%, and in large classes, it was 99.78%, with the title very practical. For learning outcomes in small classes, N-Gain is 0.98 in the high category, and in broad classes, it is 0.965 in the high category. Learning media using SAC based on local wisdom on work and energy material is valid, practical, and effective for learning.

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Author Contributions

Nurmila: Conceptualization, writing—original draft preparation, methodology, writing—review and editing; Tirtawaty Abdjul: Methodology, validation, writing—review and editing; Ritin Uloli: Formal analysis, validation, data curation.

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Conflicts of Interest

The authors declare no conflict of interest.

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