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Development of Digital Pocket Book Learning Media Animation Based on Science Subjects at State Junior High School 3 Telaga

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This study aims to develop an animated digital pocket book as a learning medium for the circulatory system and assess its validity, practicality, and effectiveness. The research used the Research and Development (R&D) method based on the Borg and Gall model, with a limited trial involving 22 eighth-grade students at SMP Negeri 3 Telaga. The media's validity was reviewed by material and media experts. Material experts gave scores of 83% (introductory aspects), 96% (content), and 100% (conclusion), categorized as very feasible. Media experts rated 100% (application intro), 100% (appearance), 88% (ending), and 100% (language), also indicating very feasible criteria. Practicality Evaluated from teacher and student activities. Teacher activities showed 100% implementation in the first meeting, and 89%–100% in the second, classified as very good. Student activities scored 67%–89% (first meeting) and 78%–89% (second), meeting good to very good criteria. Effectiveness Measured using student learning outcomes, the total n-gain score was 15.80, with an average of 0.72, which falls under the high criteria for effectiveness. In conclusion, the animated digital pocket book on the circulatory system was proven to be valid, practical, and effective as a learning tool for junior high school students.

Keywords: Development; Learning Media; Animation

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INTRODUCTION

Education is a process of improving an individual's self-quality, self-quality includes aspects of knowledge, skills and character. To support the implementation of a better life in accordance with the norms that apply in a nation and state.

The opinion above is in line with the definition in the Big Indonesian Dictionary that education is learning for each individual to achieve knowledge about certain specific objects. The knowledge obtained formally results in each individual having a mindset and morals that are in accordance with the education they have received. Also conveyed by (Arnold, 2018). Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals, and the skills needed by themselves, the nation's society and the country.

Not least, as the pioneering father of Indonesian education, Ki Hajar Dewantara also expressed his opinion regarding education, according to him, education is a guide in life for the growth of children. The meaning is that education guides all the natural strengths that exist in students so that as humans and members of society they can achieve the highest safety and happiness in life (Herlinda, 2025).

Based on several definitions of education, a conclusion can be drawn that education is a transition towards a better direction which is carried out consciously with guidance efforts including personality, skills and knowledge. Education can be obtained formally through school levels regulated by the national education system or naturally in the social environment of each individual to achieve educational goals in accordance with the ideals of the Constitution of the Republic of Indonesia.

As stated in Law no. 20 of 2003 concerning the National Education System, in article 3 the ultimate goal of implementing in national education is essentially improving the quality of human resources. To achieve these educational goals, it must be accompanied by the success of good and quality learning.

To support the success of good and quality learning, at least 3 components play a major role in achieving educational goals, namely teachers, students and teaching methods (Farida et al., 2023). These three components are a unity that mutually influence each other in the continuity of the learning process. The Information and Technology Department of IKIP Siliwangi also conveyed the same thing, in learning there are interrelated learning components, namely: teachers, students, objectives, methods, materials, media and evaluation (Herdiana & Indrowati, 2021).

The success of learning is greatly influenced by the implementation of an effective learning process. Effective learning occurs when students are able to observe, recognize, understand and identify problems according to learning objectives. Success in learning depends on the way and skills a teacher or educator teaches students (Nurhayati et al., 2022). A teacher must be skilled in teaching, when a teacher is skilled and creative in teaching then students can have good knowledge and learning experience.

Good knowledge and learning experience can be obtained when teachers are not monotonous in using media. Whether a lesson is interesting or not can be seen from the attractiveness of the learning media presented by the teacher to students. Regardless of the type of media presented to students, essentially everything comes back to the teacher, Because (Saputra, 2021) said that choosing learning media must be based on careful consideration so that the learning process can achieve its goals effectively.

As someone who understands the condition of students, teachers need to be careful in selecting the media to be used based on the problem and suitability of the media to the concept to be taught, so that there are no misconceptions with the media used which will add to students' confusion in learning. Therefore, media is indeed a very crucial factor in learning. The crucial factor that can influence the continuity of the learning process in the classroom lies in the application of interactive and varied learning media (Tafonao, 2018).

Considering the importance of using learning media, (Nuzulla, 2023) said that media is one of the most important technologies in the learning process. This encourages teachers to present media that suits the needs of the concept and students.

Along with the development of the times and technology, especially information technology, various types and forms of learning media are often used by educators to become a source of knowledge for students. Information technology used as a source of knowledge can be books, pocket books, newspapers, magazines. However, in practice, currently the use of pocket books is still practically never used by teachers anymore (Munggaran, 2022). Considering the benefits and practicality of pocket books, it is necessary to bring back the use of pocket books in learning activities (Rahmawati et al., 2024).

Pocket books are mini-sized books that contain important information and are very practical to carry so they can be read anytime and anywhere. However, currently there are still a lot of pocket books in the form of printed paper, so students tend to feel bored. There are quite a few risks that arise when the pocket book is still in printed paper form, the most common risk is that it is easily wrinkled and damaged when wet with water. Therefore, it is necessary to transform pocket books which are still printed on paper like books in general into digital pocket books (Yeni, 2022).

Digital Pocket Books are the right innovation considering that students must be equipped with adequate hard skills and soft skills, so as to produce a quality generation (Ariana et al, 2020). As science and technology develops increasingly rapidly, many pocket books have emerged with various versions and advantages, such as Android-based pocket books, bulletins, pictures and animations. This certainly makes this pocket book very popular and of interest to students in particular.

By utilizing technological developments teachers are able to present electronic multimedia on smartphones that combines text, audio, image and animation components and then modified in an interesting way so that it is hoped that it will attract students' interest in reviewing their own learning in their free time (Herlinda, 2025).

Based on the results of interviews with class VIII science teachers, students' learning outcomes in science subjects, in this case the material on the human circulatory system, are still below the minimum completion criteria, because the material is difficult to understand, and the use of learning tools is only limited to textbooks.

Another observation result was also found during the Introduction to the School Environment program implemented by Gorontalo State University, many students at SMP Negeri 3 Telaga already had smartphones. Thus, there is a need for learning media that visually shows the flow of human blood circulation to improve student learning outcomes.

Based on the description of the problem above and with the considerations above, the researcher wants to develop an animation-based digital pocket book learning media. The use of this digital pocket book media is considered to attract students' interest in learning and make it easier for each student to learn and can be studied anytime and anywhere, with the hope that this will make students' learning results good and of good quality (Djola et al., 2021).

In summary, the researcher chose the research title based on the problem above, namely "Development of Animation-Based Digital Pocket Book Learning Media in Science Subjects at SMP Negeri 3 Telaga, Gorontalo Regency"

METHOD

This research is development research, or what is known as Research & Delopment (R&D). This research and development is based on the theory according to Borg and Gall, which has been modified by (Sugiono, 2022). The product that will be developed in this research is tahe animation-based digital Pocket Book learning media. This research was carried out at SMP Negeri 3 Telaga which is located in the Village, District, Gorontalo Regency, Gorontalo Province. The time for carrying out the research is 2 months in the odd semester of the 2021/2022 academic year. The subjects in this research were students in class VIII C at SMP Negeri 3 Telaga, Gorontalo Regency. The subjects in this study consisted of 28 people.

The research procedure that will be used is as follows: The steps in this research refer to the design modified by Sugiono. R&D modified by Sugiono consists of 10 steps. However, this research was only carried out on a limited scale trial. The following are the 6 research steps: 1). Potential and Problems : The first stage of this research began with observing potential problems found at the research location. Potential problems were identified through direct observation during the implementation of PLP 2 at SMP Negeri 3 Telaga. This initial observation looks at the use of Pocket Book Digital learning media implemented at the school, 2). Information Collection : The next stage is collecting information through interviews with science teachers at SMP Negeri 3 Telaga regarding the use of digital pocket book media in learning. as well as looking at material that is difficult for students to understand, as well as analyzing the appropriate media to develop on that material, 3). Learning Media Design : Based on previously obtained data, the media that will be developed can be determined. This stage begins with analyzing Basic Competencies and staging the material, then designing the background and cover that will be made, then designing the animation that will be published in the digital pocket book. Preparing the contents/material of the pocket book by considering the needs and suitability of the material with basic competencies as well as the use of language and layout of images and animations, 4). Validation of Learning Media : This validation will be carried out by expert lecturers to determine the feasibility of using animation-based digital pocket book products and determine the quality of the media that will be produced. This validation will be tested by lecturers from various expertise, namely material expert lecturers and media experts, who will be guided by the research instrument (validation questionnaire). At this stage, validation of supporting tools, namely Learning Implementation Plans, Student Worksheets and Learning Outcome Tests, was also carried out because the researchers did not take tools that had been validated. Therefore, it is necessary to validate the devices that will be used in learning, 5). Revision of Learning Media : After the digital pocket book product has been validated by a team of experts, the product is then revised based on suggestions and input provided by material, media and device expert validators. With these suggestions and input, it is hoped that the media that will be used in learning can be perfected, 6). Limited Scale Trial : After the product has been improved, the next trial stage will be carried out at SMP Negeri 3 Telaga class VIII C. This trial stage will be carried out during two learning

meetings, in these two meetings it will be observed by 3 learning observers to see the practicality of the learning media. This stage will also be supported by using pretest and posttest. This was done to see the effectiveness of animation-based digital pocket book media (Wahyuningsih et al., 2022).

The instruments used in this research consisted of validation sheets, observation sheets and student learning outcomes tests (Rizqi & Dewi, 2022).

The validation sheet consists of: 1) Learning Implementation Plan validation sheet, 2) worksheet validation sheet, 3) Learning Results Test Validation Sheet, 4) Material expert validation sheet, 5) Media expert validation sheet. Meanwhile, the observation sheet consists of: Student activity observation sheet and teacher activity observation sheet (Welis et al., 2022).

Data analysis techniques in this research are as follows:

1. Analysis of the Validity of Learning Tools

Validation of learning tools includes the validity of lesson plans, worksheets, learning outcomes tests, learning media (by media and material experts). Validation is carried out by 3 validators (Experts) who have been determined, then from the results of the validation of the devices and media a conclusion will be drawn whether it can be used without revision, can be used with minor revisions, can be used with major revisions, and cannot be used. The results of the expert review will be used as a guide for carrying out revisions. The device validity score criteria use a Likert scale

The scale results for each aspect of the validity assessment will be calculated using the following formula:

$$Validation = \frac{(total\ score\ of\ all\ validators\ for\ each\ aspect)}{(expected\ score)}\ x\ 100\%$$

The results of the analysis of the validity aspects of the devices and media from each validator will determine the validity of the learning devices and the validity of the digital pocket book media. Media is said to be valid if it obtains feasibility analysis results above 71%.

2. Analysis of the Practicality of Learning Media

The analysis of the practicality of learning media is based on the results of observations of the implementation of learning from the activities of teachers and students in the learning process (Komarudin et al., 2021) implementation of learning using the syntax of the Discovery Learning learning model. In observing, the observer uses an observation sheet obtained from the Unpas online thesis.

Data obtained from the implementation observation sheet on teacher and student activities were analyzed using the following formula:

$$Activities\ Results = \frac{Total\ activities\ carried\ out}{expected\ score}\ x\ 100\%$$

Learning media is said to be practically used in learning when it obtains an assessment percentage of 61% and above.

3. Analysis of the Effectiveness of Learning Media

The effectiveness of digital pocket book learning media is based on student learning outcomes. Student learning outcomes are calculated using the following formula:

$$Student\ Score = \frac{Total\ score}{Maximum\ score}\ x\ 100\%$$

From the results of the learning outcomes assessment, it is then calculated using the N-Gain index. Gain is the difference between the scores from the pretest and posttest which shows the quality of improving student learning outcomes (Abdjul & Ntobuo, 2019).

$$gain = \frac{\%\ preetest - \%\ posttest}{100 - \%preetest}$$

Learning media is said to be effective in learning when it obtains a minimum N-Gain criterion greater than or equal to 0.30.

RESULT AND DISCUSSION

This development research, which was carried out at SMP Negeri 3 Telaga, produced animation-based digital pocket book learning media on the subject of the Human Circulatory System which is suitable for use in learning. In this chapter, the research results will be described with several research stages referring to R&D research method according to Sugiono's modification of Borg and Gall.

1. Analysis of Potential Problems

Based on the results of direct observations at the research location, it was found that the SMP Negeri 3 Telaga school had not used animation-based digital Pocket Book learning media on the human circulatory system. Due to the limited media used, the science teacher at the school only used textbooks available in the school library. On the other hand, the science teacher

2. Information Collection Results

Information obtained from interviews with teachers and students in class VIII C shows that there is material that is difficult for students to understand during learning, namely material about the human circulatory system. Based on information from science teachers that learning is only limited to print media, it makes it difficult for students to analyze the human blood circulatory system. Other information was also obtained from students' statements that human blood circulation must be seen visually, so that students can clearly

understand the flow of blood. human blood circulation. So with the results of collecting this information, there is a need for digital learning media that can display animations of human blood circulation.

3. Learning Media Design

Based on Basic Competencies and the material to be developed, an initial learning media design can be created using pptx to fill in all the learning material and animation of human blood circulation, after the material input is complete the pptx file is converted into HTML which is ready to be published to apk Builders. The final stage is converting the HTML file to APK Builder, the final result will automatically appear as a pocket book application that is ready to be used in learning (Ardianti & Gusfarenie, 2025).

4. Validation of Learning Media

Validation of learning media is carried out to meet the eligibility requirements for learning media, as well as measuring the quality of the learning media produced. Validation of learning media is carried out by two expert validators (media experts and material experts). However, before validating the learning media, the lesson plans, worksheets, and tests that will be used in learning are also validated.

a. Results of the Validity of the Learning Implementation Plan

Validation results were carried out by three validators. Validation of the Learning Implementation Plan is very important to determine the quality of the product that will be produced by the researcher. The results of the analysis of the Learning Implementation Plan can be seen in Figure 1.

[Figure 1 about here.]

This learning implementation plan validity test aims to find out whether a lesson plan is valid or not. Based on the validation results carried out by three validators, the presentation results were 88% -100%. These results were obtained from the validator's assessment based on the assessment aspects in Table 4.1. the results of the validation of the lesson plan show that aspects (1) Identity of the lesson plans presentation is 100% (2) Formulation of Indicators 96% (3) Learning Materials 94% (4) Learning Activities 94% (5) Assessment of Learning Outcomes 92% (6) Learning Resources 88 % (7) Use of Time 100% (8) Use of Discussion 100%. From all aspects of the validator assessment, the criteria are Feasible and Very Feasible, thus the Learning Implementation Plan is definitely valid and can be used in learning. This is in accordance with research carried out by (Nusi, 2023) on the vulnerable value (86%-100) of lesson plans suitable for use in learning.

b. Student Worksheet Validation Results

The results of the validation of Student Worksheets were carried out by 3 validators, validator 1 and validator 3 for the worksheets construct while validator 2 validated the contents of the worksheets.

[Figure 2 about here.]

[Figure 3 about here.]

The validity test of Student Worksheets aims to determine whether the worksheet that will be used is valid or not. In validating the worksheet, two assessments are used, namely construction validation and the contents of the worksheet. based on the results of all validators' assessments of the worksheet construct based on aspects of the assessment showing aspects of (1) Format (96%), (2) Language (92%) and (3) Content (96%). Meanwhile, the content validity analysis of students' worksheets shows aspects (1) content appropriateness (90%) and aspect (2) linguistics (93%). Thus, the construct validity of the worksheet is at the appropriate and very appropriate criteria. According to Arikunto in (Otoluwa et al., 2020), a device shows validity results of more than 75%, it is concluded that the product being developed is valid. Likewise, (Mirsa et al., 2023) stated that the worksheet can be said to be valid if the interpretation of the percentage score is 75-100%. Thus, the worksheet that will be used in this research is appropriate and can be used in learning.

c. Validity Analysis of Learning Outcome Tests

Validation of learning outcomes tests is carried out by three validators. The results of the assessment of the results tests are very important for calculating the validity value of the learning outcomes tests that will be implemented in learning. The results of the analysis of learning outcomes tests can be seen in Figure 4:

[Figure 4 about here.]

The validity of learning outcomes tests is carried out to see whether the tests that will be used in learning are valid or not. To test the validity of the test using a validity sheet with several aspects of assessment, based on the assessment of all validators it shows that in terms of the content of the test which contains the suitability of the question formulation with indicators and the cognitive level of students, it is 89% with appropriate criteria, secondly in terms of readability it is 96% and thirdly it is language 96%, which means that all learning outcome tests validity assessment results by three validators

have very appropriate criteria.

d. Analysis of the Validity of Learning Media

Learning Media Validity Analysis is carried out by looking at whether or not the Pocket Book learning media is valid. Pocket book media validation was carried out by two expert validators, namely the material expert validator and the media expert validator.

This validation was carried out to see the quality of the material in the animation-based digital pocket book. This material expert validation was carried out by material experts from the Biology Department, because the material developed in the media is blood circulation material. The results of the material expert validity analysis can be seen in Figure 5.

[Figure 5 about here.]

The assessment of the validity of learning media is carried out by two expert validators, namely the material expert validator and the learning media expert validator. (Puspitasari et al., 2021) in his research also carried out validation by media expert validators. This media validity assessment was carried out by a lecturer in the biology department with the aim of seeing whether the material and media met the validity criteria.

Based on processing data on the validity of material experts based on the questions in the validation questionnaire, as stated by (Puspitasari et al., 2021), the material expert questionnaire contains questions related to the material in the media being developed. The following are the percentage results of the aspects in the validation questionnaire: (1) Introduction Aspects 83% (2) Learning Material Aspects 96% (3) Bibliography Presentation Aspects 100%. It can be seen that the percentage value of material experts is 83% -96%. This shows that the material in the media is appropriate. Validity criteria according to (Bentriska & Suprijono, 2022) if the percentage results are in the range of 86-100% with the material validity criteria obtained in this study, it can be said that the material in the digital pocket book media can be used with some minor revisions in the concept of small and large blood circulation, This revision aims to further perfect the material that will be included in the learning media. After revising the learning media material section, further validation can be carried out, namely validation of the learning media by media experts.

[Figure 6 about here.]

Validation of learning media was carried out by learning media experts from the physics department. The assessment of the validity of learning media consists of several aspects, namely: (1) Application Introduction Aspect (2) Application Appearance Aspect (3) End of Application. However, during validation, there were several suggestions from the validator, namely that the cover should use several color combinations to increase students' interest in reading. Then a section on how to use the application was added at the beginning of the application to make it easier for students to operate the digital pocket book media developed by the researcher. After revising the learning media, the validity of the pocket book media obtained a percentage value of 100%, this shows that the media is very suitable and can be used in learning.

5. Limited Scale Trial of Animation-Based Digital Pocket Book Learning Media

This limited scale trial was carried out in two learning meetings, namely the first and second meetings. This trial was carried out to see the practicality and effectiveness of animation-based digital pocket book learning media.

The practicality of digital pocket book media can be seen from the results of the analysis of learning implementation through teacher activities and student activities (Lukum, 2015). The following are the results of observations of the implementation of learning at the first and second meetings.

a. Practicality of Learning Media

The practicality of digital pocket book learning media can be seen from the results of observations of learning implementation on digital pocket book learning media. This was also stated by (Muzzalifa & Oktaviani, 2021) that the practicality of learning media is based on the implementation of learning. Implementation observations using Discovery Learning syntax on teacher activities and student activities in two learning meetings conducted by 3 observers. Digital pocket book learning media is said to be practical if it meets the criteria of good and very good.

1) Implementation of Learning (Teacher Activities)

The practicality of pocket book learning media is seen through the implementation of learning based on teacher activities in the classroom, teacher activity is measured through observation sheets on implementation of learning

[Table 1 about here.]

[Table 2 about here.]

Based on Tables 1 and 2, the implementation of learning through teacher activities at the first meeting shows that

observer 1 implemented 9 with a percentage (100%), observer 2 implemented 8 with a percentage (89%) and observer 3 implemented 8 with a percentage (89%). There were steps that were not implemented in step 5 and step 9. Meanwhile, at the second meeting all steps for implementing the learning had been completely implemented. The following are the results of the analysis of the percentage of implementation of teacher learning activities in two meetings.

Based on the percentage figure for the implementation of learning through teacher activities, namely 89%-100%, the animation-based digital pocket book learning media is in the very good criteria. Thus, animation-based digital pocket book media can be said to be very practical in terms of carrying out teacher activities

2) Implementation of Learning Through Student Activities

The practicality of pocket book learning media is seen through the implementation of learning based on the teacher's activities in the classroom, student activity is measured through the learning implementation observation sheet.

[Table 3 about here.]

[Table 4 about here.]

Based on Table 3 and 4, the implementation of learning through student activities at the first meeting shows that there were steps that were not implemented in step 3, step 6 and step 9. Meanwhile, at the second meeting, the steps that were not implemented were step 3 and step 6. The following are the results of the analysis of the percentage of implementation of learning activities teacher in two meetings.

Shows that at the first meeting the percentage of observer 1 (89%) had very good criteria, observer 2 (78%) had good criteria and observer 3 (67%) had good criteria. Meanwhile, at the second meeting, the percentage of implementation obtained was observer 1 (89%) with very good criteria, observer 2 (78%) with good criteria and observer 3 (78%) with good criteria. Thus, the practicality of learning media is practical in its use.

The effectiveness of the pocket book learning media is seen based on the students' learning outcomes using the N-Gain Index obtained during the pre-test and post-test on learning about the human circulatory system. The following are the pre-test and post-test results of class VIII C students:

[Table 5 about here.]

Based on the table of student learning outcomes above, the n-gain index results for each student are as follows.

[Figure 7 about here.]

The effectiveness of learning media is obtained from the test scores of students' or respondents' learning outcomes. The respondents in this learning outcomes test were 22 people who were class VIII C students at SMP Negeri 3 Telaga. To find out students' learning outcomes, a pretest and posttest were carried out.

The results of the test on student learning outcomes showed that the pretest percentage of students was 28% and the posttest percentage was 72%, so in this case there was an increase in student learning outcomes after using animation-based digital pocket book learning media on the subject of the human circulatory system as evidenced by the n index. -high student gain.

Based on data obtained from respondents, it shows that N-Gain is in the range of 0.50-0.79 with an average percentage of 0.72. Thus, the average N-Gain value of all respondents is in the very high criteria, which means that digital pocket book learning media is very effective for use in learning.

CONCLUSION

Based on the results of the analysis and discussion described in the previous chapter, a conclusion can be drawn that the development of animation-based digital pocket book media that has been developed is valid, practical and effective, as follows: 1) Validity of Learning Implementation Plans, Student Worksheets, Learning Outcome Tests, Digital Pocket Book Media which were developed based on the results of assessments by 3 validators including suggestions, opinions and input in the validation process stating that the tools and learning media has been valid with several minor revisions. Thus, the devices and media are suitable for testing in learning. 2) The practicality of the digital pocket book learning media developed, based on the results of observations of learning implementation (discovery learning) both in teacher and student activities, shows that the media is practical for use in learning. 3) The effectiveness of digital pocket book media which was developed based on the results of student learning outcomes tests, shows that digital pocket book media is effectively used in the learning process.

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REFERENCES

Abdjul, T., & Ntobuo, E. (2019). Penerapan Media Pembelajaran Virtual Laboratory berbasis PhET terhadap Hasil Belajar Siswa pada Materi Gelombang. *Jurnal Pendidikan Fisika Tadulako (JPFT), 7*(3), 26-31.

Ardianti, R. K., Putra, D., & Gusfarenie, D. (2025). Pengaruh Media Animasi Terhadap Peningkatan Aktivitas IPA di Sekolah Menengah Pertama. *EDU-BIO: Jurnal Pendidikan Biologi, 8*(1), 35-46.

Ariana, D., Situmorang, R. P., & Krave, A. S. (2020). Pengembangan Modul berbasis Discovery Learning pada Materi Jaringan Tumbuhan untuk Meningkatkan Kemampuan Literasi Sains Siswa Kelas XI IPA SMA. *Jurnal Pendidikan Matematika dan IPA, 11*(1), 34-46.

Arnold, R. B. (2018). Pengembangan Media Pembelajaran Video Animasi Powtoon pada Mata Pelajaran Pelayanan Penjualan di SMK Ketintang Surabaya. *Jurnal Pendidikan Tata Niaga (JPTN), 6*(1), 25–31.

Bentriska, H. K., & Suprijono, A. (2022). Pengaruh Media Pembelajaran Educandy terhadap Hasil Belajar Kognitif Sejarah Siswa SMAN 3 Sidoarjo. AVATARA, *e-Journal Pendidikan Sejarah, 12*(4), 1-8.

Djola, T. A., Abdjul, T., & Ntobuo, N. E. (2021). Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbantuan PhET Simulations terhadap Keterampilan Proses Sains Siswa pada Materi Pemantulan dan Pembiasan Cahaya. *JPFT (Jurnal Pendidikan Fisika Tadulako Online), 9*(1), 1-6.

Farida, L., Suryajaya, S., & Suyidno, S. (2023). Profile of Basic and Integrated Science Process Skills in Science Learning at Madrasah Ibtidaiyah Negeri. *SEJ (Science Education Journal), 7*(2), 99-109.

Herdiana, L. E., Sunarno, W., & Indrowati, M. (2021). Studi Analisis Pengembangan E-Modul IPA berbasis Inkuiri Terbimbing dengan Sumber Belajar Potensi Lokal terhadap Kemampuan Literasi Sains. *Inkuiri: Jurnal Pendidikan IPA, 10*(2), 89-98.

Herlinda, D. (2025). Pengembangan Buku Saku Digital pada Materi Manajemen Berbasis Anyflip pada Pembelajaran Ekonomi di MAN 2 Kota Pekanbaru. Universitas Islam Negeri Sultan Syarif Kasim Riau. http://repository.uin-suska.ac.id

Komarudin, K., Utari, I. D., & Farida, F. (2021). Pengembangan Buku Saku Digital Berbasis STEM terhadap Pemahaman Konsep Matematis. J*P3M (Jurnal Penelitian Pendidikan dan Pengajaran Matematika), 7*(2), 97–106. https://doi.org/10.37058/jp3m.v7i2.3221

Lukum, A. (2015). Evaluasi Program Pembelajaran IPA SMP Menggunakan Model Countenance Stake. *Jurnal Penelitian dan Evaluasi Pendidikan, 19*(1), 25–37. https://doi.org/10.21831/pep.v19i1.4552

Mirsa, F. R., Islamiyah, A. N., Rizki, I. A., Saputri, A. D., Ramadani, R., & Habibulloh, M. (2023). The Description of Students' Creativity and Motivation in Physics: Introducing Madurese Local Wisdom "Karapan Sapi" as Ethnophysics Learning Media. *SEJ (Science Education Journal), 7*(2), 147-166.

Munggaran, R. (2022). Pengembangan Buku Saku Berbasis Mind Mapping pada Pembelajaran IPA. *Jurnal Kreatif: Jurnal Kependidikan Dasar, 9*(1), 1–2.

Muzzalifa, S., & Oktaviani, C. (2021). Pengembangan Media Belajar Buletin dalam Bentuk Buku Saku pada Materi Termokimia. *Journal of Mathematics and Natural Science Education, 2*(1). https://doi.org/10.35719/mass.v2i1.52

Nurhayati, Sudarman, & Astuti, R. F. (2022). Analisis Kesesuaian Materi Buku Teks Ilmu Pengetahuan Sosial. *Jurnal Kreatif: Jurnal Kependidikan Dasar, 9(1), 1–2.*

Nuzulla, W. (2023). Pengembangan Media Pembelajaran Buku Saku Digital Berbasis Aplikasi Android pada Pembelajaran Bahasa Indonesia. UIN Ar-Raniry. http://repository.ar-raniry.ac.id

Otoluwa, Y., Eraku, S., & Yusuf, D. (2020). Pengembangan Media Pembelajaran Berbasis Lectora Inspire yang Diintegrasikan dengan Camtasia Studio pada Mata Pelajaran Geografi Materi Sistem Informasi Geografi. *Jambura Geo Education Journal, 1*(1), 01-08.

Puspitasari, M., Primasatya, N., & Wahyudi, W. (2021). Pengembangan Media Pembelajaran Pocket Book Pada Materi Macam-Macam Sumber Energi Kelas IV Sekolah Dasar. In *Prosiding SEMDIKJAR (Seminar Nasional Pendidikan dan Pembelajaran*) (Vol. 4, pp. 550-559).

Rahmawati, A., Setoresmi, A. S., Malau, B., Novitasari, D. A., & Munawaroh, F. R. S. (2024). Pengaruh Penggunaan Media Games Interaktif dalam Pembelajaran Sains untuk Meningkatkan Kemampuan Berpikir Kritis Anak. *Jurnal PG-PAUD Trunojoyo: Jurnal Pendidikan dan Pembelajaran Anak Usia Dini, 11*(1), 49-61.

Rizqi, N. R., & Dewi, I. (2022). Mathematics Learning in the Era of Society 5.0 in Terms of the Objectives and Ideology of Mathematics Education. *Mathematics Learning, 6*(2).

Saputra, R. S. (2021). Pengaruh Penggunaan Media Pembelajaran Digital terhadap Hasil Belajar Siswa. *Jurnal Pendidikan dan Pembelajaran, 10(2), 45–52.*

Sugiono, I. (2022). *Pengembangan Lembar Kerja Peserta Didik (LKPD) berbasis Multiple Representation untuk Meningkatkan Kemampuan Representasi Ilmiah* (Doctoral dissertation, IAIN Ponorogo).

Tafonao, T. (2018). Peran Media Pembelajaran dalam Meningkatkan Minat Belajar. *Jurnal Komunikasi Pendidikan, 2*(2), 103–114.

Wahyuningsih, P. I., Nuryatin, A., & Pristiwati, R. (2022). Pengembangan Media Interaktif Berbasis Adobe Flash dengan Pendekatan Content and Language Integrated Learning (CLIL) untuk Meningkatkan Kemampuan Membaca Siswa SD. *Jurnal Basicedu, 6*(2), 1990-2001.

Welis, W., Darni, K., Rifki, M. S., & Chaeroni, A. (2022). Effect of Stunting Handling and Physical Activity on Motor Ability and Concentration of School Children. *International Journal of Human Movement and Sports Sciences, 10*(5), 1040-1046.

Yeni, Y. M. (2022). Pengembangan Media Pembelajaran Buku Saku Digital pada Materi Plantae sebagai Sumber Belajar Siswa Kelas X MAN. http://repository.metrouniv.ac.id

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

LIST OF TABLES

TABLE 1 / The First Meeting

Observation Aspect	Observer		
	1	**2**	**3**
Step 1	1	1	1
Step 2	1	1	1
Step 3	1	1	1
Step 4	1	1	1
Step 5	1	0	1
Step 6	1	1	1
Step 7	1	1	1
Step 8	1	1	1
Step 9	1	1	0
Total Implemented	**9**	**8**	**8**
Persentase	**100%**	**89%**	**89%**
Criteria	**Very Good**	**Very Good**	**Very Good**

TABLE 2 / The Second Meeting

Observation Aspect	Observer		
	1	**2**	**3**
Step 1	1	1	1
Step 2	1	1	1
Step 3	1	1	1
Step 4	1	1	1
Step 5	1	1	1
Step 6	1	1	1
Step 7	1	1	1
Step 8	1	1	1
Step 9	1	1	1
Total Implemented	**9**	**8**	**8**
Persentase	**100%**	**100%**	**100%**
Criteria	**Very Good**	**Very Good**	**Very Good**

TABLE 3 / The First Meeting

Observation Aspect	Observer		
	1	**2**	**3**
Step 1	1	1	1
Step 2	1	1	1
Step 3	0	0	0
Step 4	1	1	1
Step 5	1	1	1
Step 6	1	0	0
Step 7	1	1	1
Step 8	1	1	1
Step 9	1	1	0
Total Implemented	**9**	**8**	**8**
Persentase	**89%**	**78%**	**69%**
Criteria	**Very Good**	**Good**	**Good**

TABLE 4 / The Second Meeting

Observation Aspect	Observer		
	1	**2**	**3**
Step 1	1	1	1
Step 2	1	1	1
Step 3	0	0	0
Step 4	1	1	1
Step 5	1	1	1
Step 6	1	0	0
Step 7	1	1	1
Step 8	1	1	1
Step 9	1	1	1
Total Implemented	**9**	**8**	**8**
Persentase	**89%**	**78%**	**78%**
Criteria	**Very Good**	**Good**	**Good**

TABLE 5 / Student Learning Outcomes

% Preetest	% Posttest	N-gain	Categori
28	79	0,72	High

LIST OF FIGURES

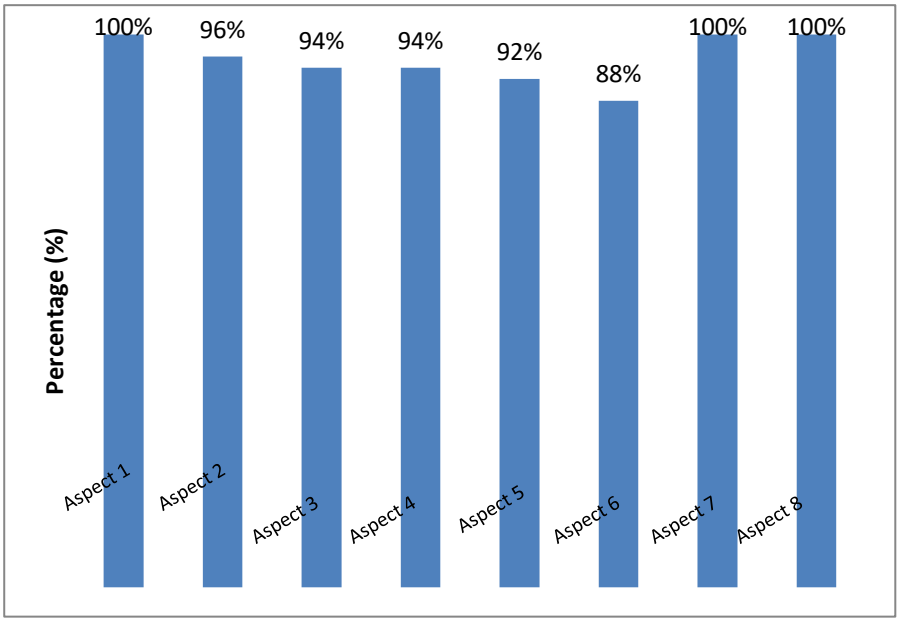

FIGURE 1 / The Results of the Analysis of the Learning Implementation Plan

Information:
Aspect 1: Identity of lesson plans
Aspect 2: Formulation of indicators
Aspect 3: Learning materials
Aspect 4: Learning activities
Aspect 5: Assessment of learning outcomes
Aspect 6: Learning resources
Aspect 7: Use of time
Aspect 8: Use of language

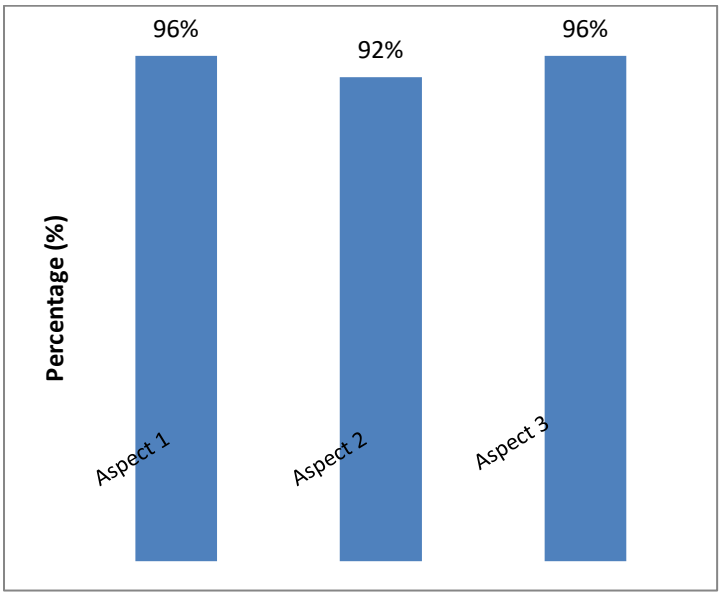

FIGURE 2 / Results of Student Worksheet Construct Validation

Information:
Aspect 1: Format
Aspect 2: Language
Aspect 3: Content

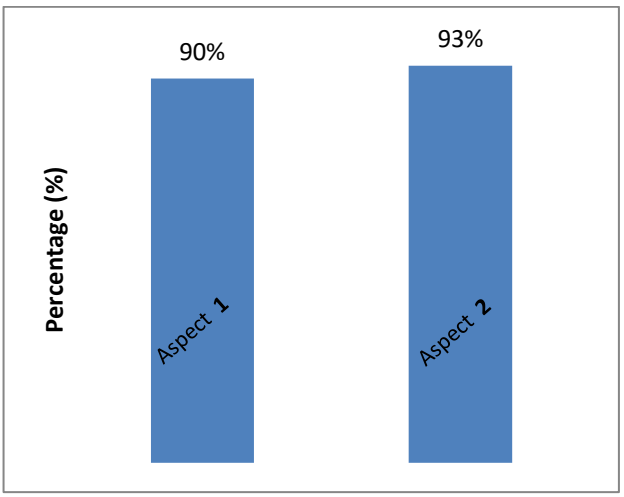

FIGURE 3 / Results of Student Worksheet Content Validation

Information:
Aspect 1: Appropriateness of content
Aspect 2: Language

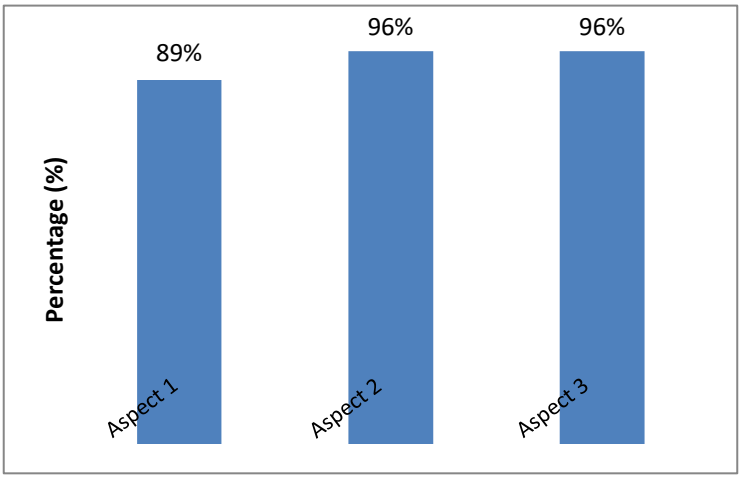

FIGURE 4 / The Results of the Analysis of Learning Outcomes Tests

Information:
Aspect 1: Content
Aspect 2: Readability
Aspect 3: Language

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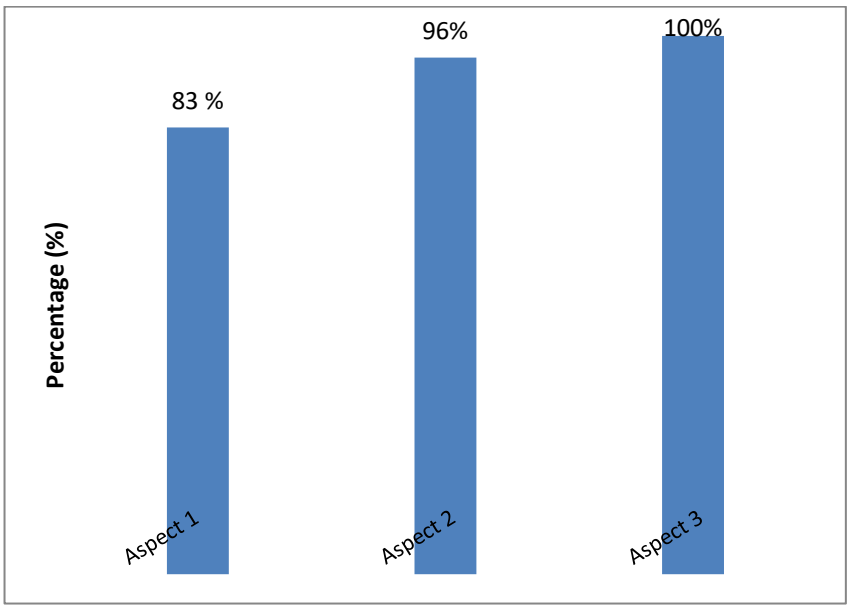

FIGURE 5 / The Results of the Material Expert Validity Analysis

Information:
Aspect 1: Introduction
Aspect 2: Learning Materials
Aspect 3: Closing

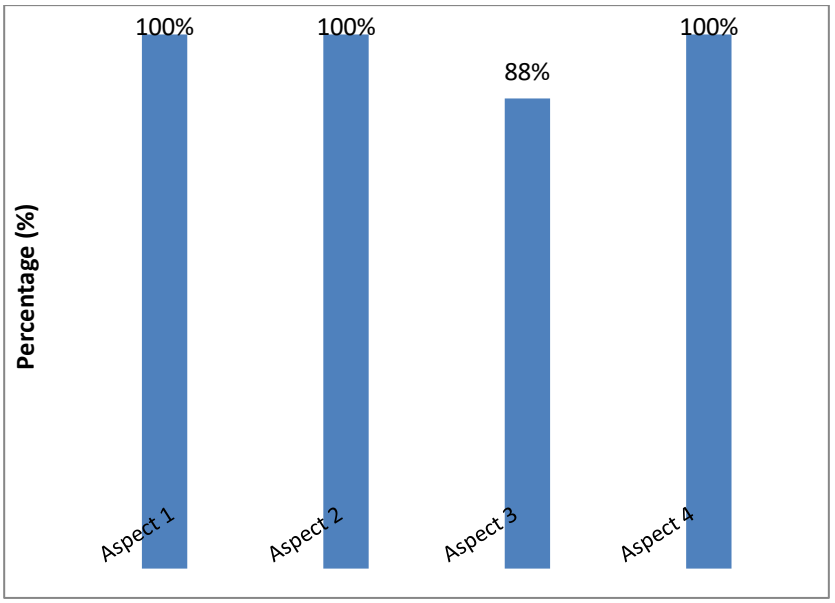

FIGURE 6 / Media Expert Validity Analysis

Information:
Aspect 1: Application Introduction
Aspect 2: Appearance
Aspect 3: End of Application
Aspect 4: Language

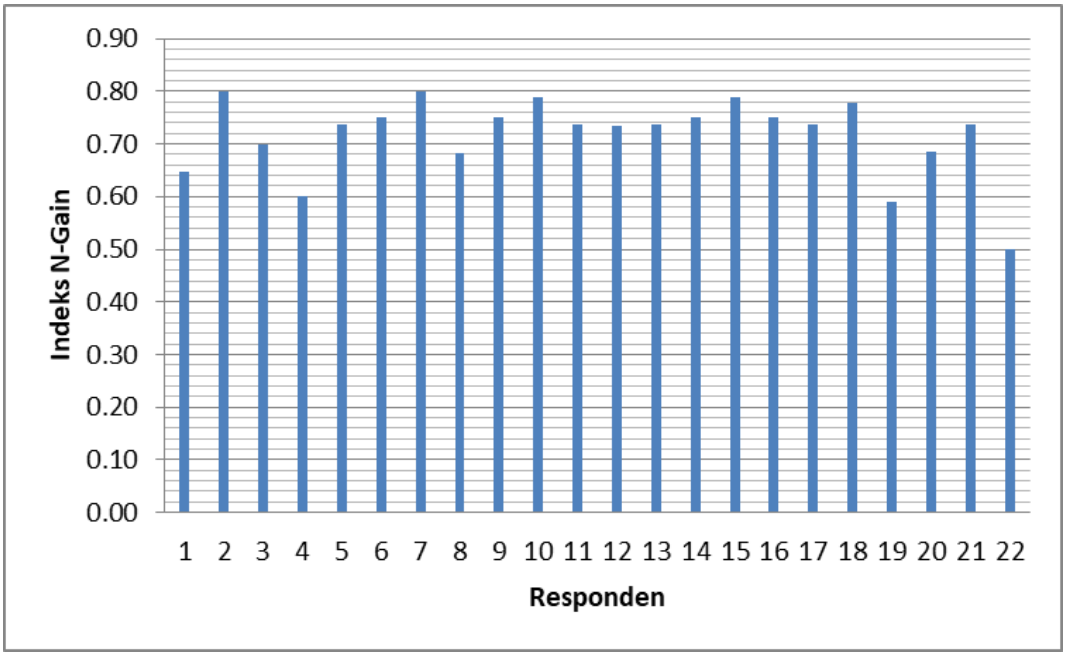

FIGURE 7 / Analysis of Student Learning Results Using Indexes N-Gain Learners