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# DEVELOPMENT OF AN INTERACTIVE MULTIMEDIA-BASED WEBSITE SUPPORTED BY INTERACTIVE POWERPOINT FOR ELEMENTARY STUDENTS

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**Abstract**

This study was motivated by observations at SDN Sukorame 2 Kediri, which showed low student learning outcomes in the subject of changes in the form of matter and minimal use of interesting and interactive learning media. These conditions had an impact on low student enthusiasm and understanding in learning. This study aims to develop interactive multimedia based on a website using Interactive PowerPoint (Popin) on the subject of changes in the form of matter in the 4th grade IPAS subject at SDN Sukorame 2 Kediri. The research method used is R&D with the 4D model (Define, Design, Development, and Disseminate). The research instruments include a questionnaire for expert validation of material and media, a questionnaire on practicality for teachers and students, and an effectiveness test. Data analysis is used to determine the level of validity, practicality, and effectiveness of the product. The results of the study show that the interactive multimedia developed was considered highly valid by media experts 93% and subject matter experts 89.1%. The practicality test was considered very practical with a score of 87.4% from teachers and 100% from students. The effectiveness test was considered effective based on classical learning completeness reaching 76%. The novelty of this research lies in the integration of Interactive PowerPoint (Popin) into a website platform so that the media can be accessed without additional applications and provides a more dynamic and flexible learning experience for students. These findings contribute to the development of learning technology that is easy for educators to use but still effective in improving conceptual understanding.

**Keywords:** Interactive Multimedia, Website, Powerpoint, Changes in the State of Matter

**Abstrak**. Penelitian ini dilatarbelakangi oleh hasil observasi di SDN Sukorame 2 Kediri yang menunjukkan rendahnya hasil belajar siswa pada materi perubahan wujud benda serta minimnya penggunaan media pembelajaran yang menarik dan interaktif. Kondisi tersebut berdampak pada rendahnya antusiasme dan pemahaman siswa dalam proses pembelajaran. Penelitian ini bertujuan untuk mengembangkan multimedia interaktif berbasis website menggunakan Interactive PowerPoint (Popin) pada materi perubahan wujud benda dalam mata pelajaran IPAS kelas IV di SDN Sukorame 2 Kediri. Metode penelitian yang digunakan adalah *Research and Development* (R&D) dengan model 4D (*Define, Design, Development,* dan *Disseminate*). Instrumen penelitian meliputi angket validasi ahli materi dan ahli media, angket kepraktisan untuk guru dan siswa, serta tes efektivitas. Analisis data dilakukan untuk menentukan tingkat validitas, kepraktisan, dan efektivitas produk. Hasil penelitian menunjukkan bahwa multimedia interaktif yang dikembangkan dinilai sangat valid oleh ahli media sebesar 93% dan oleh ahli materi sebesar 89,1%. Uji kepraktisan menunjukkan kategori sangat praktis, dengan skor 87,4% dari guru dan 100% dari siswa. Uji efektivitas menunjukkan bahwa media tergolong efektif berdasarkan ketuntasan belajar klasikal yang mencapai 76%. Kebaruan penelitian ini terletak pada integrasi Interactive PowerPoint (Popin) ke dalam platform website sehingga media dapat diakses tanpa aplikasi tambahan serta memberikan pengalaman belajar yang lebih dinamis dan fleksibel bagi siswa. Temuan ini berkontribusi pada pengembangan teknologi pembelajaran yang mudah digunakan oleh pendidik, namun tetap efektif dalam meningkatkan pemahaman konsep.

**Kata kunci:** Multimedia Interaktif, Website, PowerPoint, Perubahan Wujud Benda

## Introduction

The rapid development of technology in the world of education requires teachers to be able to adapt to its progress. Educational technology is software or hardware found in computers that uses educational theory to facilitate and communicate in a learning environment (Rosmana et al., 2023). Teachers or educators are required to be literate and adaptive in the development of technology in education. Education in the current era has begun to use information and communication technology in the learning process (Rajagukguk et al., 2021). Education is a conscious and planned effort by humans to understand themselves and their environment and to achieve change within themselves (Ulhusna et al., 2020). Education is an important means of improving the quality of knowledge in order to be able to face the future (Tanjung & Silalahi., 2022). It can therefore be concluded that education is a process that must be undertaken by a human being in order to acquire knowledge for their own benefit.

Based on observations conducted at SDN Sukorame 2 Kediri, the school has implemented a new curriculum, namely the independent curriculum, in which teachers are expected to use technology in the learning process. When the researcher accompanied the teachers in the learning process, it was found that the teachers were proficient in creating technology-based learning media, but the creation process was time-consuming, so they rarely used the media in the learning process. Therefore, students tend to lack enthusiasm in the learning process, which affects their understanding of the material being taught. Students' low learning outcomes in the material on changes in the form of matter are due to the lack of use of interesting and interactive learning media. During the learning process, the

only resources used are student books and teacher books, but sometimes teachers also give quizzes using the Quiziz platform and have never used websites or PowerPoint.

Based on the issues discussed above, there is a need to develop interactive multimedia in the learning process, particularly in IPAS lessons at SDN Sukorame 2 Kediri, so that the learning process can achieve learning outcomes and learning objectives. The development of interactive multimedia is a challenge for researchers to be able to develop interactive multimedia that can be applied effectively in the IPAS learning process. IPAS is one of the subjects taught in elementary schools. The IPAS material taught is about changes in the form of substances, which is found in chapter 2 of the 4th grade elementary school curriculum. The material on changes in the form of substances is important to learn because in this material, students are invited to understand and learn about changes in the form of substances. With interactive multimedia, IPAS learning, which is usually only conventional, can become interesting and increase student participation in IPAS learning. The interactive multimedia chosen by the researchers was PowerPoint because it can help combine text, images, videos, transitions, and animations to create an engaging learning medium for students (Alfaruqi et al., 2025). The researchers then created a website on Google Sites, a platform provided by Google for creating websites for free. PowerPoint was then incorporated into the website that had been created. Its advantage is that it can be accessed from various devices without having to open the PowerPoint application. There are texts, images, and videos in one learning medium (Nafitri et al., 2024). The general objective of this study is to determine the validity, practicality, and effectiveness of website-based interactive multimedia using PowerPoint Interactive (Popin) to improve student understanding and assist educators or teachers in the learning process so that the learning process is more interesting and not monotonous.

According to (Zega et al., 2022), interactive multimedia learning is an intermediary that plays a role in supporting the success of an ongoing learning process. Meanwhile, according to (Shaquille & Zen 2023), interactive multimedia is a type of multimedia that can be interacted with by the user of the multimedia. Based on these two opinions, interactive multimedia is a learning aid that contains text, images, videos, animations, and transitions that can be interacted with by users.

According to (Wahyudin & Rahayu, 2020), a website is a collection of web pages and supporting files such as images, videos, and other digital files stored on a web server that can be accessed via the internet. Meanwhile, according to (Winata & Adelia 2023), technically, a website is a collection of pages that are grouped into a specific domain or subdomain. Based on these two opinions, a website can be defined as a collection of interconnected pages that can be accessed via the internet.

According to (Eska et al., 2022) Microsoft PowerPoint is presentation software created by Microsoft. Meanwhile, PowerPoint can be called interactive learning media if it can support interaction between students and learning media thanks to its features (Anomeisa & Ernaningsih, 2020). Based on these two opinions, Microsoft PowerPoint can be defined as an application provided by Microsoft Office that is intended to help convey information accurately and in an easy-to-understand manner. The use of Interactive PowerPoint integrated into websites provides advantages over other learning media because it can be accessed without the need to install additional applications on students' devices (Qistina et al., 2019). This integration presents more dynamic material through a combination of text, images, videos, animations, and interactive buttons, making the learning experience more interesting and easier to understand (Octaviana et al., 2022). Additionally, teachers can quickly update materials through the website platform, making it a more flexible, economical, and practical solution compared to other digital media that require special devices or incur certain costs (Husna et al., 2022).

Based on the explanation of the problems above, the researcher decided to focus on developing learning media entitled “Development of Interactive Website-Based Multimedia Assisted by Interactive PowerPoint (Popin) on the Subject Matter of Changes in the Form of Objects in the IPAS Subject for Grade 4 at SDN Sukorame 2 Kediri.”

## Method

Based on the problems described by the researcher, the method used in this study is the R&D (Research and Development) method. According to (Sugiyono, 2019), research and development is a research method used to create specific products and test their effectiveness. According to Okpatrioka, O. (2023), Research and Development (R&D) is a research method that aims to produce specific products. According to Pramono (2022), research and development (R&D) is defined as a type of research that focuses on developing, expanding, and exploring further a theory in a particular discipline. From several explanations of the definition, it can be concluded that research and development is also defined as research used to obtain data so that it can be used to produce, develop, and validate the products being made.

This study used the 4D development model procedure developed by S. Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel (1974). The stages in the 4D development model are Define, Design, Development, and Disseminate. The researchers chose this development procedure because of its detailed, systematic steps, which are easy to apply in development research (Pasaribu et al., 2025). The data collection instruments consisted of questionnaires for expert validation of materials and media, questionnaires on practicality for

teachers and students, and questionnaires on effectiveness. The sample selection in this study used purposive sampling, where the sample was selected based on certain considerations in accordance with product development needs. The research sample consisted of 25 fourth-grade students at SDN Sukorame 2 Kediri, aged 9-10 years. Fourth-grade students were selected because the material on changes in the form of matter is covered in the fourth-grade science learning outcomes, so students at this level are the most relevant subjects for testing the developed media. Data analysis techniques were used to measure validity, practicality, and effectiveness. This study was conducted at SDN Sukorame 2 Kediri with 25 students during the research process.

**Results and Discussion**

This research began with the definition stage. At this point, initial data was collected to determine the research subject. After determining the subject, the researcher interviewed teachers to find out the current learning problems. Therefore, learning media was needed to overcome these problems. There were five stages in the definition stage, as follows:

a. Front-end Analysis

A preliminary assessment was conducted to identify problems encountered in the learning process. The problem found in the field was that teachers more often used the lecture method in the learning process, with Quiziz as the medium used.

b. Learner Analysis

Analysis of students is essential in the early stages of planning. Fourth-grade students at Sukorame 2 Public Elementary School in Kediri City were the subjects of this study. The students encountered at this school tended to lack enthusiasm during the learning process. They were busy talking with their classmates and did not pay attention to the teacher during the learning process.

c. Task Analysis

One of the purposes of task analysis is to determine the important tasks that students must perform during the learning process. One of the main purposes of task analysis is to enable students to connect what they learn at school with the things they do every day.

d. Concept Analysis

Concept analysis aims to determine learning outcomes that can be included in learning media. This analysis covers the integrated science and technology (IPAS) material theme on changes in the form of matter. The results of the concept analysis conducted by the researcher are based on the learning outcomes in the Ministry of Education and Culture's guidebook. The learning outcomes are “students identify changes in the form of matter and changes in the form of energy in everyday life.”

e. Purpose Specifications

After conducting a series of analyses, learning objectives will be specified in accordance with the results of the analysis. The learning objectives are: 1) students can explain the meaning of changes in the form of matter, 2) students can name changes in the form of matter that occur in everyday life, 3) students can come up with simple ideas about how to utilize changes in the form of matter in everyday life.

Design Stage

After identifying the problems in the definition stage, the next step is the design stage. The creation of interactive multimedia is tailored to learning outcomes, learning objectives, and the independent curriculum. This design stage includes:

a. Test Development (Criterion-Test Construction)

In developing this test, researchers provided pretest questions, media usage, and posttest questions. This was intended to determine whether students could understand the learning material delivered using interactive multimedia based on a website assisted by Interactive PowerPoint (Popin).

b. Media Selection

Media selection was carried out to identify learning media that was relevant to student characteristics and material, and suited to student needs. The learning media used by the researcher is a combination of a website and PowerPoint, called Interactive PowerPoint (Popin). The researcher chose this media because it contains text, images, videos, transitions, animations, and hyperlinks. The aim is to make it easier for students to understand the material being taught and to attract their attention during the learning process.

c. Format Selection

The format selection was done at the initial stage. The format selection was done so that the selected format would be suitable for the learning material. The learning media created by the researcher uses a format that the researcher considers to be very relevant to the material and also interesting for students. For the cover design, the researcher provided images of various changes in the form of matter, while for the content, the researcher provided images and videos. This was intended to make it easier for students to understand the material. The researcher also embedded transition and animation features in the learning media so that students would not get bored when using it. The researcher also included a video to enhance students' understanding of the material being studied.

d. Initial Design

The initial design for creating interactive multimedia based on the PowerPoint Interactive (Popin) website features a website layout created on Google Sites, a free website

creation platform from Google. The PowerPoint will contain text, images, videos, transitions, and animations, as well as hyperlinked buttons.


Figure 1. Website Display


Figure 2. Interactive PowerPoint Home Screen

Development Stage

This development stage aims to produce interactive multimedia based on a website assisted by Interactive PowerPoint (Popin). The validity is intended for subject matter experts and media experts, while the practicality is intended for teachers and students of grade 4 at SDN Sukorame 2 Kediri. The effectiveness is measured by giving a pretest and then a posttest to students of grade 4 at SDN Sukorame 2 Kediri.

a. Validity Test Results

The subject matter expert validator was Dr. Poppy Rahmatika Primandiri, M.Pd. The researcher provided a questionnaire consisting of four aspects, including 1) content suitability, 2) presentation suitability, 3) language suitability, and 4) suitability to the characteristics of fourth-grade elementary school students with 22 indicators. The score obtained was 98 out of a maximum score of 110, so the media expert validation results obtained a score percentage of 89.1% with a very valid criterion. In addition, the media expert validator was Mr. Muhammad Najibulloh Muzaki, M.Cs. The researcher provided a questionnaire consisting of 4 aspects, including 1) appearance and content, 2) media usage, 3) technical aspects, and 4) usefulness with 17 indicators. The score obtained was 79 and

the maximum score was 85, so the media expert validation results obtained a score percentage of 93% with a very valid criterion.

During the material and media expert validation stage, the researcher received suggestions from both experts, namely 1) the website should be designed as a single page without scrolling, 2) the images in the material section must be appropriate and clear, 3) the PowerPoint background should be aligned with the material, and 4) color selection should be based on a color palette.


Figure 3. Website Display After the Expert Validation Stage


Figure 4. PowerPoint Display After the Expert Validation Stage

b. Practicality Test Results

The teacher of grade 4 was assessed by Mrs. Lita Dwi Septyarini, S.Pd. The researcher provided a questionnaire consisting of 5 aspects, including 1) material, 2) visual and audio, 3) media, 4) learning, and 5) language with 27 indicators. The score obtained was 118 out of a maximum score of 135, meaning that the practicality test results for teachers obtained a percentage of 87.4% with the criteria of very practical. In addition, the practicality test for students was given to all 4th grade students at SDN Sukorame 2 Kota Kediri. The total number of students during this research process was 25 students. The researcher gave a questionnaire to students covering 4 aspects, including 1) usage and language, 2) material, 3) appearance and content, and 4) media usage with 10 indicators. The score obtained was 250 with a maximum score of 250, so the student practicality test obtained a percentage of 100% with the criteria of very practical.

c. Effectiveness Test Results

In this effectiveness testing stage, the researcher first gave a pretest to 25 students. This was done to determine whether the students still remembered the material that had

been taught. Then, interactive multimedia based on a website using PowerPoint Interactive (Popin) was used in the learning process through two stages, namely together with the researcher and the students trying out the use of interactive multimedia based on a website using PowerPoint Interactive (Popin) with the following results:

Table 1. Pretest and posttest results

| No. | Name | KKM | Pretest | Postest | Description |
|---|---|---|---|---|---|
| 1 | AAG | 78 | 80 | 100 | Completed |
| 2 | AH | 78 | 80 | 80 | Completed |
| 3 | ANQ | 78 | 70 | 80 | Not yet finished |
| 4 | ASK | 78 | 90 | 100 | Completed |
| 5 | ANMP | 78 | 90 | 90 | Completed |
| 6 | AM | 78 | 80 | 80 | Completed |
| 7 | ANS | 78 | 80 | 100 | Completed |
| 8 | DAU | 78 | 80 | 80 | Completed |
| 9 | DKCP | 78 | 70 | 80 | Not yet finished |
| 10 | DL | 78 | 90 | 90 | Completed |
| 11 | HKR | 78 | 80 | 90 | Completed |
| 12 | IAP | 78 | 90 | 90 | Completed |
| 13 | IWN | 78 | 80 | 90 | Completed |
| 14 | KAA | 78 | 60 | 80 | Not yet finished |
| 15 | KJD | 78 | 70 | 80 | Not yet finished |
| 16 | KWAS | 78 | 90 | 90 | Completed |
| 17 | MAW | 78 | 60 | 80 | Not yet finished |
| 18 | MKR | 78 | 80 | 90 | Completed |
| 19 | MZI | 78 | 80 | 80 | Completed |
| 20 | MAZ | 78 | 80 | 90 | Completed |
| 21 | NMN | 78 | 60 | 80 | Not yet finished |
| 22 | RAA | 78 | 90 | 90 | Completed |
| 23 | RNS | 78 | 80 | 90 | Completed |
| 24 | SBA | 78 | 90 | 90 | Completed |
| 25 | VFAN | 78 | 80 | 80 | Completed |
| Score Obtained | | | 1980 | 2170 | - |
| Maximum Score | | | 2500 | 2500 | - |
| Average | | | 79,2 | 86,8 | - |
| Classical Learning Completion | | | - | - | 76% |

Based on the results in Table 1, it can be concluded that interactive multimedia based on the PowerPoint Interactive (Popin) website is effective in the learning process, with a KBK score of 76%, where 19 out of 25 students were declared to have mastered the material and 6 students were declared to have not yet mastered it. From these results, it can be concluded that Popin is effective and can be used in the learning process. In the context of education, the effectiveness of a learning medium is demonstrated by its ability to help students achieve the predetermined learning completeness. In this study, classical learning mastery was set at 75%, so that an achievement of 76% indicates that most students understood the material after using the developed website-based interactive multimedia assisted by Interactive PowerPoint (Popin). The increase in scores from the pretest to the posttest also shows that the media had a positive effect on student understanding. Although

some students did not achieve the minimum passing grade, the increase in the average score from 79.2 to 86.8 shows that the use of website-based interactive multimedia assisted by Interactive PowerPoint (Popin) was able to strengthen students' mastery of the concept of changes in the form of matter. Thus, this media can be categorized as effective because it meets the indicators of learning success and has a direct impact on student learning outcomes.

Dissemination Stage

The objective of this stage is to disseminate interactive multimedia based on PowerPoint Interactive (Popin)-assisted websites. In this study, only limited dissemination was carried out, namely by disseminating and promoting the final product of interactive multimedia based on PowerPoint Interactive (Popin)-assisted websites in a limited manner at SDN Sukorame 2 Kediri.

This type of research is research and development, often referred to as R&D. This research uses the development procedure from S. Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel (1974: 5), the 4D development model. The stages in the 4D development model are Define (definition), Design (design), Development (development), and Disseminate (dissemination).

The first stage is definition, which focuses on identifying problems and needs that will form the basis for product development. The second stage is design, which involves planning and designing the product, starting from the initial design of the website and PowerPoint. The third stage is development, which is the most important stage because the planning, design, and development processes are based on questionnaires that have been given to material and media validators during validation. The material validation expert is a lecturer from the Faculty of Health and Science, biology study program, namely Dr. Poppy Rahmatika Primandiri, M.Pd. and the media expert is a lecturer from the Faculty of Engineering and Information, information systems study program, namely Muhammad Najibulloh Muzaki, M,Cs. The practicality test was given to a fourth-grade teacher, Mrs. Lita Dwi Septyarini, S.Pd, and 25 fourth-grade students at SDN Sukorame Kediri. Interactive multimedia based on a website assisted by Interactive PowerPoint (Popin) was displayed in front of the class using an LCD projector, then the students tried to operate it using laptops or computers provided by the school. Next, an effectiveness test was conducted by giving pretest and posttest questions to fourth-grade students at SDN Sukorame 2 Kediri.

Overall, the data obtained from interactive multimedia based on PowerPoint Interactive (Popin) website-assisted material on the subject of changes in the form of matter in science and technology education was assessed as highly valid, highly practical, and effective for use in the learning process. The data obtained from subject matter experts was

89.1%, media experts 93%, teacher practicality 87.4%, student practicality 100%, and effectiveness in this study, referring to classical learning completeness, was 76%.

Although the website-based interactive multimedia assisted by Interactive PowerPoint (Popin) showed very valid, very practical, and effective results, there were several limitations in its implementation. One of the challenges encountered was the dependence on a stable internet connection, because the media could only be accessed through a website. Under certain conditions, the devices used by students also had varying specifications, so that not all students could operate the media smoothly. Additionally, teachers need time to adapt to the interactive features and learn how to upload updated materials to the website.

Further research could develop an offline version of this multimedia so that it can be used without relying on an internet connection. Researchers can also explore the use of other platforms such as mobile applications or Learning Management Systems (LMS) to expand accessibility. In addition, subsequent research can test the effectiveness of this PowerPoint Interactive (Popin)-based interactive website multimedia on other IPAS materials or in different classes so that the generalization of findings can be expanded.

The final stage is dissemination, in which researchers distribute website-based interactive multimedia assisted by PowerPoint Interactive (Popin), which is considered highly valid, practical, and effective. The dissemination stage is limited to SDN Sukorame 2 Kota Kediri, where the researcher provides a file in the form of a link to teachers, which can then be sent to the WhatsApp group for parents. The link is as follows: https://sites.google.com/view/perubahan-wujud-zat-benda-/halaman-muka.

## Conclusion

Based on the results of development using the 4D model, researchers produced interactive multimedia based on a website assisted by Interactive PowerPoint (Popin) on the subject of changes in the form of matter in the IPAS subject for grade 4 at SDN Sukorame 2 Kediri. This media has been proven to help improve student understanding and learning outcomes in the learning process. Based on data analysis, it can be concluded that the developed interactive multimedia website-based PowerPoint Interactive (Popin) received the following ratings: 1) highly valid based on the results of validity tests by subject matter experts and media experts with scores of 89.1% and 93%, 2) highly practical based on the results of the practicality test conducted by teachers with a score of 87.4% and students with a score of 100%, and 3) effective based on the results of the effectiveness test through a post-test with a score of 76%, thus demonstrating that the media is capable of improving students' understanding of the material on changes in the form of matter. As a follow-up, this interactive website-based multimedia assisted by Interactive PowerPoint (Popin) has the

potential to be applied more widely to other IPAS subjects and to different grade levels. Further development can also be done by adding an automatic evaluation feature, enriching multimedia content, or adapting the media to other platforms such as mobile applications. Thus, this development is not only beneficial for learning in fourth grade, but can also serve as a basis for innovation in interactive learning media in a broader educational context.

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