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Development of Nearpod Media Assisted with Songs to Improve Learning Outcomes in the Concept of Natural Science on the Material of Force

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Abstract: The development of science makes using technology-based learning media important to create effective and interesting learning. The use of nearpod media can improve student learning outcomes. This study examines the feasibility and effectiveness of song-assisted nearpod products on force materials. The development model used in this study is ADDIE, which has five stages: Analysis, Design, Development, Implementation, and Evaluation. The subjects in the study were 28 students in grade IV of elementary school. The research instruments used were interview sheets, observation sheets, questionnaire sheets, and tests. The study results show that the near pod developed is a very feasible product, with a feasibility percentage of 95% from material experts and 94% from media experts. In addition, the results of the questionnaire responses showed a percentage of 96% of teachers and 94% of students, which indicated that the use of near pods was very feasible both in terms of attractive appearance, ease of access, features such as songs and practicum to contribute to the improvement of student learning outcomes as evidenced by the results of pretest and posttest tests. The normality test was carried out using the Shapiro-Wilk analysis technique with a pretest significance value of 0.061 and post-test data with a significance value of 0.113, which showed normal distributed data. The paired sample t-test showed an increase between the pretest and post-test results with a significant value of 0.000 < 0.05. The N-gain test of 0.7919 or 79% carried out is included in the high category. This shows an increase between pretest and posttest results. This means that developing song-assisted nearpod media effectively improves student learning outcomes. The test score results indicate a significant change in science learning outcomes, namely an increase in posttest scores after applying nearpod media in learning compared to the pretest score before the application of nearpod media.

Keywords: Force; Learning Outcome; Song; Natural Sciences; Nearpod.

Introduction

Natural and social science (IPAS) is an integrated study that trains students to think logically and analytically. IPAS is a scientific study discussing living things, their environment, and the universe. IPAS is a combination of natural sciences and social sciences. This merger aims to enable students to manage between the natural and social environment in one unit [1]. Integrating natural sciences and social sciences can also increase the relevance of learning to the real world and develop skills needed in the era of globalization, such as critical thinking, communication, collaboration, and innovation. The concept of IPAS emphasizes the provision of learning experiences and the development of students' self-abilities [2]. The current independent curriculum integrates science and social studies studies, which are merged into IPAS. The independent curriculum aims to foster interest, curiosity, and critical thinking, creativity, and skills of students through science and technology learning [3].

The merger of science and social studies subjects is also expected to strengthen multicultural education and develop a better understanding of various cultures, histories, and social conditions in Indonesia. This is in line with the vision and mission of the independent learning curriculum, which emphasizes the development of inclusive, equitable, and globally minded education[4]. IPAS is important to study because it encourages students' curiosity about various phenomena around them. This curiosity drives an understanding of how the universe works and its interaction with human life on Earth. Therefore, researchers are interested in conducting research in the study of IPAS. However, considering the breadth of scientific studies on science and technology that includes natural and social aspects, this research is limited by focusing on natural science subjects.

Science learning contains factual knowledge about the universe and its contents. Science subjects are considered difficult by students because they require the ability to think logically, reason, understand concepts, and memorize, and often involve mathematical calculations in the form of complex formulas, so students experience difficulties in learning. This is a special challenge, including in learning force material. The concept of force is one of the basic scientific materials that is important for students to understand because it explains various phenomena around human life. Force affects objects' motion, shape changes, and interactions between objects. Students can relate science theory to everyday life through force learning, such as how vehicles move, objects fall, or various tools work. However, students often consider science a difficult subject. This difficulty is often caused by the delivery of less interesting

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material that does not involve direct experience, so students think the force material is difficult to understand, which has implications for low learning outcomes. In addition, concrete objects are needed in the science learning process to provide a good understanding of the material. In contrast, concrete objects are not always easy to find in the application of learning. These difficulties indicate the need for teachers' creativity in applying learning media.

Based on the data from teacher interviews and observations of grade IV SD Negeri Bringin 02, problems were found in the learning process of science force materials, such as the lack of attractiveness of the media used during learning. The media used is still dominant in printed books. Furthermore, teachers utilizing technology-based media are still not optimal and have not used innovative and interesting media, which has implications for the lack of understanding of the concept of the material being taught. These problems have relatively low implications for students' learning outcomes. The low learning outcomes in grade IV of SD Negeri Bringin 02 in the science learning content of force material are evidenced by the number of students who achieved KKTP, which was only 6 (21.4%) out of 28 students. This indicates that 22 (78.6%) students still have not met the KKTP. The KKTP for science subjects is 75.

Learning activities are considered successful when 75% of the students in the class can achieve the predetermined KKTP [5]. From the data on the learning outcomes of grade IV of SD Negeri Bringin 02, only 21.4% of students were said to be successful in understanding science learning. Students understand the material from the teacher's teaching and conveying the subject. Therefore, teachers' ability to operate and use learning media is essential in the digital era. The researcher developed an interesting digital learning media for grade IV elementary school students based on this situation. The media is used to solve SD Negeri Bringin 02's problems and measure the developed media's feasibility and effectiveness. In this case, the media developed is a song-assisted nearpod for class IV force material.

Nearpod is an interactive website or application that has the potential to be used as a learning medium. This is in line with [6] nearpods are useful in creating interactive learning between teachers and students in the classroom. Nearpod is an application that is used as a learning space where educators can create interactive presentations such as videos, *slides*, and quizzes, as well as any form of evaluation designed by educators in learning [7]. Nearpod, which was developed as a learning medium, can package the design of materials, songs, and an interactive animation video in the form of images and text with an attractive design so that students do not get bored during the learning process. This nearpod media is also inserted with virtual simulations and several quiz games related to force materials. The success of learning can be supported through the variety of features of the Nearpod media developed, including songs.

The nearpod media, assisted by a song entitled "Force Around Us", contains material on the form of force and its influence in the surrounding life so that it can make it easier for students to remember the material through the song. The media of songs is an actual source of language where students can use the song to learn at school and at home. Songs can be adapted to learning connected to science materials and can be sung anytime and anywhere [8] Songs whose lyrics contain material on the forms of force, such as muscle force, gravitational force, friction force, magnetic force, and spring force, can make it easier for students to relate theoretical concepts with examples of force in everyday life, for example in the event of falling objects, pulling and pushing between objects, objects attracting magnets, friction between objects, or the use of simple spring tools such as rubber and catapults.

Songs are used as a medium for conveying messages and materials so that learning becomes fun [9]. This is also in line with research [10] The solution to create learning variations is to use song media. The use of songs is not only as a medium of entertainment but also as a medium in the process of memorizing various new terms or information for students [11]. Using songs in science learning can effectively overcome the complexity of science concepts that students often consider difficult. In addition, songs create a fun learning atmosphere, so students are more motivated to participate actively in the learning process. The song with the theme "Force Around Us", developed as a learning medium, was presented in nearpod media as a recorded video featuring lyrics containing science learning material. For example, the song explains the force of attraction on a magnet or the force of force on an object, accompanied by simple visualizations that support students' understanding. The song can then be integrated into interactive learning platforms such as Nearpods, which allow students to interact directly with the material through quizzes, simulations, and other activities that can accommodate the essence of science.

Integrating nearpod-based learning media with songs represents a novel innovation that can potentially enhance student learning outcomes. Nearpod, functioning as an interactive platform, facilitates student engagement by offering features such as quizzes, videos, and live simulations. Incorporating educational songs enhances concept comprehension by leveraging music's capacity to enhance memory, clarify material, and foster a more positive learning environment. Furthermore, the integration of songs can serve as a pedagogical tool, facilitating the comprehension of complex concepts and enhancing student engagement. Consequently, incorporating Nearpod with songs in learning environments can be a promising strategy to improve student engagement and learning outcomes.

Based on the background, the objectives of this study are to 1) describe the design form of song-assisted nearpod media development; 2) describe the feasibility level of song-assisted nearpod media in improving the learning outcomes of science of force materials; 3) measure the level of effectiveness of song-assisted nearpod media in improving the learning outcomes of the science of force materials. Research on song-assisted nearpods has the urgency to provide innovations in the field of education in improving student learning outcomes. As an interactive medium, nearpods provide a more dynamic learning experience through the features in the media, while songs can improve memory and make it easier to understand material concepts. The combination of the two can create more engaging and effective learning.

Research Methods

This research uses the Research and Development (R&D) method. Development research refers to a method

that leads to the design and development of a learning product that meets the set standards [12] The ADDIE model was chosen in this study, and it has five stages: analysis, design, development, implementation, and evaluation.

In the analysis stage, the researcher determines the needs and appropriate materials for developing song-assisted nearpod media. The design stage involves conceptualizing media and arranging instruments to measure the feasibility of a song-assisted nearpod. Furthermore, at the development stage, a song-assisted nearpod is developed based on a concept created and validated by media and material experts. The implementation phase includes using a song-assisted nearpod validated in the learning process to test its effectiveness. Finally, the evaluation stage, the final part of the ADDIE research model, is carried out at each stage of development to revise and improve the product, as well as a thorough evaluation to assess the effectiveness of the implementation of song-assisted nearpod media. This model was chosen because ADDIE has steps that demonstrate a structured approach to the instructional development process [13].

The figure details the product development flow concerning the ADDIE model. 1

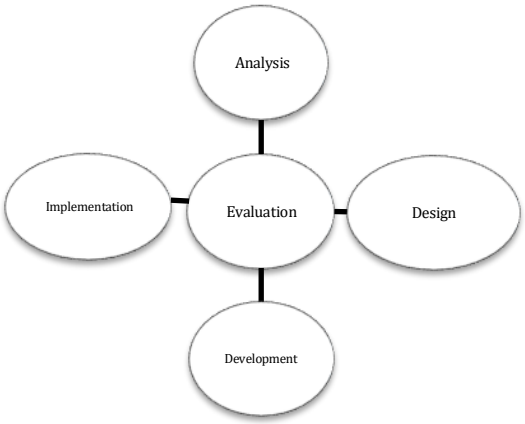

Figure 1. ADDIE Development Model Flow [14]

The collection of data is achieved through the implementation of both test and non-test techniques. The test technique involves the provision of pre-test and post-test materials to students. Meanwhile, the non-test technique is conducted through interviews, observations, and filling out needs and response questionnaires from teachers and students. Data analysis was carried out using qualitative descriptive techniques, quantitative descriptive techniques, and inferential statistics. Qualitative descriptive analysis to describe what happens in the field obtained through observations, responses, suggestions or inputs from experts related to song-assisted nearpod media. Meanwhile, quantitative descriptive is used to measure the results of feasibility scores from experts, teachers, and students related to song-assisted nearpod media. The inferential statistics were utilised to assess the efficacy of nearpod products by implementing normality tests, paired sample t-tests, and N-gain data statistical tests.

Data analysis to measure the level of product feasibility was carried out through song-assisted nearpod feasibility analysis and analysis of teacher and student responses after using song-assisted nearpod media. The feasibility analysis of the song-assisted nearpod was carried out by media and material validators. The results of expert validation are analyzed using the formula according to [15] as follows:

$$NP = \frac{R}{SM} \times 100\%$$

Information:
NP = percent value sought
R = raw score obtained
SM = maximum score of the questionnaire in question

The results of the percentage of eligibility data are then converted according to the eligibility criteria of expert validation according to [16] presented in the following table:

Table 1. Expert validation eligibility assessment

Percentage	Criterion
$81\% < x \leq 100\%$	Highly Worthy
$61\% < x \leq 80\%$	Proper
$41\% < x \leq 60\%$	Quite Decent
$21\% < x \leq 40\%$	Less Worthy
$0\% \leq x \leq 20\%$	Not Eligible

[16]

After the learning process, teachers and students were invited to respond to questions using a response questionnaire. The responses were analysed using the formula outlined by [15] as follows:

$$NP = \frac{R}{SM} \times 100\%$$

The results of the data analysis percentage from the response questionnaire were converted with the criteria according to [16] presented in the following table:

Table 2. Assessment of the feasibility of teacher and student response questionnaires

Percentage	Criterion
$81\% < x \leq 100\%$	Highly Worthy
$61\% < x \leq 80\%$	Proper
$41\% < x \leq 60\%$	Quite Decent
$21\% < x \leq 40\%$	Less Worthy
$0\% \leq x \leq 20\%$	Not Eligible

[16]

This study uses data analysis techniques in two stages: initial data analysis, including normality tests, and final data analysis, including T-tests and N-Gain tests. This normality test measures whether students' learning scores are normally distributed on the pretest and posttest. The normality test in SPSS can be analyzed using the sig value results. The decision-making requirements used are as follows:

Table 3. Normality test criteria

Result	Criterion
If the Sig value > 0.05	Normally distributed
If the Sig value < 0.05	not normally distributed

[17]

The t-test in this study uses the paired sample t-test, which aims to measure the difference between the average pretest and posttest with paired samples. The paired sample t-test was carried out using SPSS with the following research hypotheses:

H_0 = There is no average difference between the pretest and posttest results, which means that there is no effect of using song-assisted nearpod media to improve learning outcomes in the concept of science essence on force materials
H_a = There is an average difference between the results of the pretest and posttest, which means that there is an influence of the use of nearpod media assisted by songs to improve learning outcomes in the concept of the essence of science on force materials. The decision-making requirements in the paired sample t-test are as follows:

Table 4. Test Criteria paired sample t-test

Persentase	Criteria
Significance value (2-tailed) < 0.05	H_0 rejected and H_a accepted
Significance value (2-tailed) > 0.05	H_0 is accepted and H_a is rejected.

[18]

Meanwhile, in data analysis to determine the level of effectiveness of the use of song-assisted nearpod media in learning force material science, the N-gain formula is used. N-Gain is the measurement of the change in test scores, calculated by comparing the post-test score with the pre-test score, with the difference between the maximum possible score and the pre-test score. The N-Gain value is determined using the formula outlined by Lestari and Yudhanegara in [20].

$$\text{N-gain} = \frac{\text{score posttest} - \text{skor pretest}}{\text{score maksimal} - \text{skor pretest}}$$

Table 3. N-gain value criteria

N-gain value	Criterion
N-Gain ≥ 0.70	Tall
0.30 < N-Gain < 0.70	Keep
N-Gain ≤ 0.30	Low

[19]

Results and Discussion

This research was conducted at SD Negeri Bringin 02, Ngaliyan District, Semarang City, with research subjects consisting of 28 students, 5 male and 23 female. The research entitled "Development of Song-Assisted Nearpod Media to Improve Learning Outcomes in the Concept of Science Essence in Force Materials" uses the ADDIE development model, which consists of five stages: analysis, design, development, implementation and evaluation. The following are the steps in developing song-assisted nearpod media products, as carried out by the researchers in accordance with the ADDIE development model.

Analysis Stage

Media development began with a needs analysis through data collection conducted at SDN Bringin 02 through interviews and observations. The analysis stage aims to identify the needs in media development and determine the requirements that must be met in the learning media development process. The researcher conducted a material analysis to determine the suitability of learning outcomes with the material taught. The selection of force material in this study is integrated with nearpod media, in line with the statement [20] the concept of force is difficult for students to understand, which is influenced by the interesting learning process and lacks media. Students have not been able to distinguish the concept of force in the form of pull or push, as well as the concept of understanding the definition of force and still often have difficulty distinguishing forms of force such as muscle force, friction force, magnetic force, spring force, and gravitational force. Based on this analysis, interactive learning media is needed to help students remember the concept of force material, one of which is using songs. The song is integrated into nearpod media. Nearpod media has many features, including videos, songs, and virtual simulation menus. This is in harmony with force material that requires practicum to align with the needs of students. In this case, the researcher used a needs questionnaire for students and teachers to identify the needs needed to develop media products.

Design Stage

At the product stage, it is designed according to the analysis results. The media design is adjusted to the results of the questionnaire on the needs of teachers and students as the basis for further media development. It is important in designing media to pay attention to aspects of design, material, and language so that the media made is on target and in accordance with the needs of students. Media design begins with determining the design theme, preparing media content, and designing images and animation videos. The force material in nearpod media is designed with the help of the Canva app. The design of the material focuses on the selection of attractive appearances, bright colors that match the characteristics of elementary school students, and the use of easy-to-read writing fonts.

The researcher also designed a learning song that contains the concept of force and various forces to help students in learning. The stage of drafting the song concept begins with writing lyrics that are appropriate to learning force material. The song media developed entitled "Force Around Us" is audiovisual-based with the help of the BandLab application, accompanied by a guitar instrument to aid in audio recording. At the same time, the video design is made with the help of the Canva application, which contains animations with moving pictures, songs, and running song lyrics that go hand in hand with the song's melody.

Animated video media contains material on the concept of attraction and push between objects and the effects of force on objects (motion, shape, direction) accompanied by animated descriptions to make learning videos interesting. The media will be used to learn the concept of force material with animation themes in the form of the environment, which aligns with the concept of force often encountered with examples of its use in daily life. The media is designed to display materials, videos, songs, and virtual simulations of practicum to facilitate student learning as a whole. Thus, students gain a complete understanding of the concept of force material so that learning outcomes also increase. This is the advantage of the media developed.

Development Stage

The development stage is related to media product development activities based on the design that has been made. The stages carried out by the researcher in developing song-assisted nearpod media include: 1) developing media design according to the initial design, 2) validating the learning media that has been made to media experts and material experts, 3) improving the learning media based on the input of media validators and material validators.

The product produced in this study is a nearpod media assisted by a song entitled "Force Around Us" designed using the help of Canva. This nearpod media, whether containing songs or videos, is developed according to the needs of grade IV students in science subjects, especially force materials. Here's a look at the results of the song-assisted nearpod media development:

Figure 1. Media cover display

On the first page, it displays the title of the material contained in the nearpod learning media, namely Force Around Us. The display of media is presented with bright images and colours to suit the characteristics of elementary school students. The images presented illustrate examples of daily life activities related to force.

Figure 2. Learning Outcomes

The next page is learning achievements. This page contains information about what students need to achieve after following the learning process in the science subject of force material. Students learn about the definition of force, the influence of force in daily life, various forms of force, and examples of its application in daily life (Figure 2).

Figure 3. Learning Videos

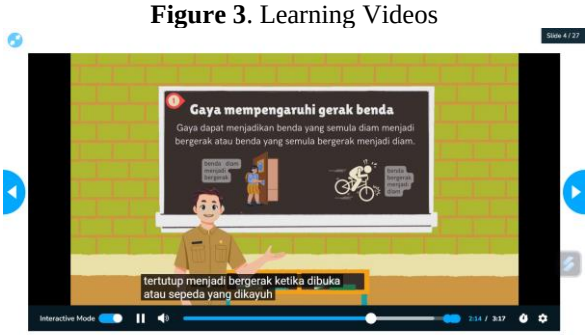

Figure 4. Materials in Learning Videos

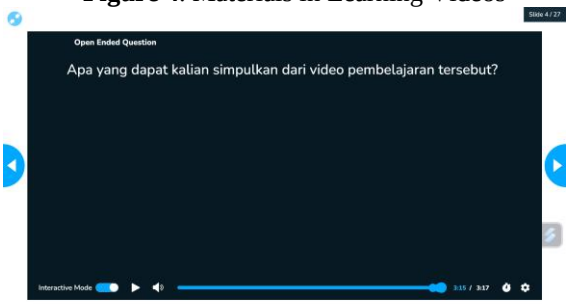

Figure 5. Open Ended Question learning video

The development of nearpod media uses the integration of features such as integrated learning videos from YouTube. The learning videos leverage the help of ElevenLabs for voice actors and Canva for video design. The material on force is divided into 2, namely the definition of force and the influence of force on the motion, shape, and direction of objects. The material is presented in a learning video with picture animations (pictures 4 and 5). Nearpod media integrates *open-ended questions* in the video, allowing for a comprehensive evaluation of student's understanding after listening to the learning video. Through the open-ended question feature, students can write down the conclusion of the material so that the teacher gets a clear picture of the extent of the student's understanding of the material after watching the video. (fig. 6).

Figure 6a. Song display

Figure 6b. Lyric song "Force Around Us"

The song media is made using Canva to create a design from the video so that the song media is audiovisual. The music used in the song uses guitar accompaniment. The song video is designed with an example theme from various forces in daily life. Moving song lyrics are also presented in the video to make it easier for students to sing songs. The lyrics of the song entitled "Force Around Us" are as follows:

Figure 7. Lyrics

Song lyrics contain information about the meaning of force: force can be a form of pull or push on an object. The song lyrics also explain examples of the form of muscle force, friction force, magnetic force, spring force, and gravitational force. In addition, the song lyrics also contain the influence of force, namely, the force can affect the motion of objects, direction, and shape of objects.

The material display contains the meaning of muscle, frictional, magnetic, spring, and gravitational forces. In contrast, the material is more detailed, containing concepts and facts about various forces and examples. The material is presented in different slide sections for each type of force (Figure 3).

This virtual simulation is integrated into Phet Colorado's Nearpod media, which provides a virtual practicum room that students can access for free. Students conducted a practicum on spring force that increases in length because the object's weight gives it force (Figure 4).

The evaluation section presents a display of questions in a game where students can choose a character to take the quiz. The characters are presented in various forms with animal themes. Furthermore, the nearpod media will display evaluation questions. Every correct answer the learner chooses will level up the game character (Figure 5).

Figure 8. Sub menu material

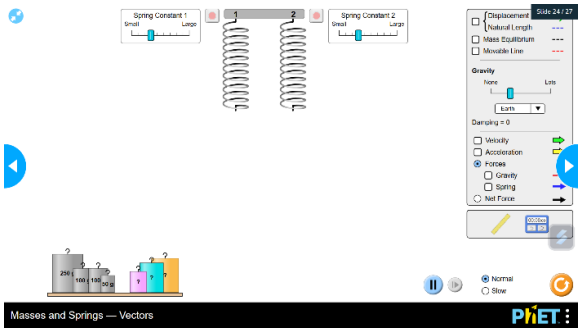

Figure 9. Virtual Simulation

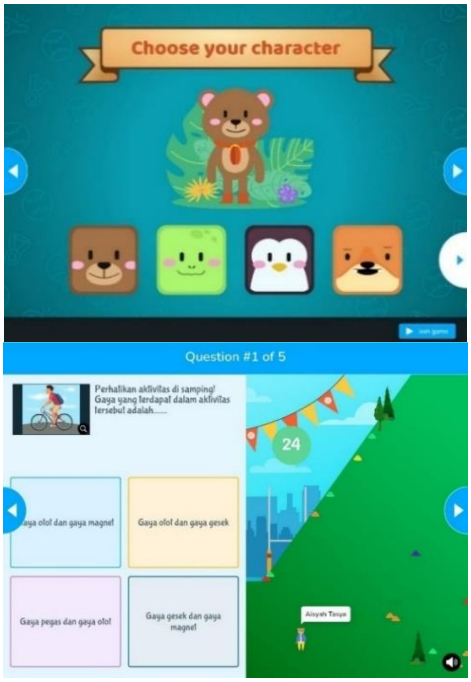

Figure 10. Evaluation questions

The next step after developing media is media validation and material validation to determine the level of product feasibility. The validator provides input related to the media developed by the researcher so that the researcher makes revisions according to the directions. The revision was done by adding a simulation menu section to the magnetic material using a gizmo. The following is the display of the simulation section after the revision by adding a magnet material practicum menu.

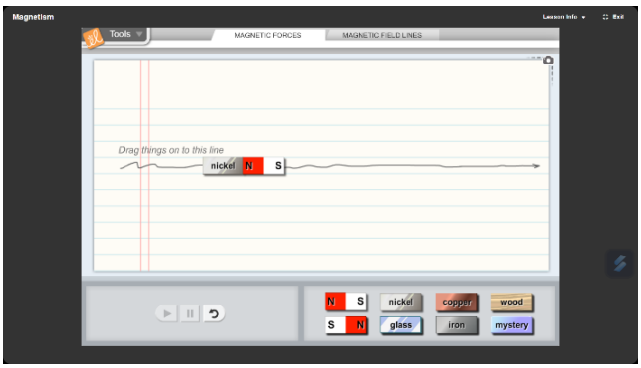

Figure 11. Magnetic practicum with gizmos

After that, to find out whether or not the song-assisted nearpod media is feasible, expert validation and media validation will be carried out. The results of the recapitulation of the assessment of material experts and media experts on the song-assisted nearpod application are as follows:

Table 4. Recapitulation of material and media validation results

Expert	Presents	Criterion
Material	95%	Highly Worthy
Media	94%	Highly Worthy

Media validation is used to assess the feasibility of the media developed. Aspects assessed in media validation related to the suitability of the design to the topic taught, practicality, flexibility, and the ability to last for a long time, the attractiveness of media presentations, and aspects of the feasibility of use and utilization of the product. As for those assessed regarding media validation, they received a score of 94%, which is a very decent category.

The aspects assessed in material validation include the suitability of the material, the suitability of the presentation of the material with the level of thinking of the students, and the presentation of learning materials to support learning. The initial score for material validation was 88%, with a very feasible category for later revisions related to the adjustment of learning objectives to begin with the form of verbs, improvement of the order of learning scenarios, adjustment of question grids and evaluation questions to be in line with learning objectives, as well as input from material experts to include real practicum activities into the learning media. After the revision, the final score was obtained with a percentage of 95%. Thus, the material listed in the learning media conforms with the scope of science material, precisely the force, so it is classified as a very feasible criterion.

Implementation Stage

The learning activity process will test products that have passed the material and media experts' validation stage. The research was conducted in two stages at SDN Bringin 02. The first stage constituted a small-scale study, and the second comprised a large-scale one. The small-scale study involved 6 students, while the large-scale study involved 22 students. According to [21] the number of respondents for small groups ranges from 4-14 people, while large groups range from 15-50 respondents. The small group trial aims to evaluate song-assisted nearpod media products and identify potential obstacles that arise during the learning process.

In implementing the research in grade IV of SDN Bringin 02, the initial stage involved working on 25 multiple-choice questions to measure students' initial understanding of force material before applying the product in learning. In the next stage, learning I and II were carried out using a nearpod assisted by songs. Following the conclusion of the learning process, students are administered a post-test comprising 25 multiple-choice questions. The results of this post-test are utilised to evaluate students' understanding of the force material following the integration of song-assisted Nearpod products into the learning process. Pretest and posttest data were analyzed using normality tests, t-tests, and n-gain to evaluate the improvement of student learning outcomes and the product's effectiveness.

Table 5. Hasil Uji Normalitas Shapiro Wilk

Description	Sig.	Criterion
Pre-test	0.061	Normal
Post-test	0.113	Normal

Table 5 shows the pre-test data demonstrates a significance value of 0.061, and the post-test data demonstrates a significance value of 0.113. The results of the significance data exceed 5% (>0.05), indicating that the data is normally distributed. The next step is to conduct a

paired sample t-test to compare the mean scores of the students on the pre-test and post-test. The procedure is as follows:

Table 6. Paired sample t-test

	Mean	t	df	Sig. (2-tailed
Pretest-Posttest	-48.909	-21.188	21	.000

In table 6, the obtained value of the significance test (sig. (2-tailed)) is 0.000. This value is less than 0.05, thus indicating that the H_a hypothesis is accepted and the H_o hypothesis is rejected. Therefore, it can be concluded that a difference exists in the pretest and posttest values before and after the implementation of the Nearpod media. After obtaining the results of the data have significant differences, the next is to measure the effectiveness of the product through the N-gain test shown in the following table:

Table 7. N-Gain Test Results

	N	Min	Max	Mean	Std. Deviation
N-gain	22	.61	.94	.7919	.08749
Valid N (listwise)					

The results of the N-gain test received a score of 0.7919, meaning there is an increase between high pretest and posttest scores. Based on data, it can be inferred that using nearpod media assisted by songs is proven effective in improving student learning outcomes with a > category of 0.7 and is included in the high category.

Furthermore, the suitability of a medium can be evaluated based on the feedback gathered from response questionnaires filled out by teachers and students in both small-scale and large-scale groups. This process was carried out for grade IV students of SDN Bringin 02, with the results of the questionnaire that has been collected showing the following:

Table 8. Teacher response questionnaire

Description	Persentase	Criterion
Students	94%	Very worthy
Teacher	96%	Very worthy

The results of the student response questionnaire showed a figure of 94% in large groups, so it was included in the very feasible criteria. The analysis of the student response questionnaire showed that the Nearpod media, assisted by songs, had an attractive appearance and ease of use and was suitable for the material in the media content. Meanwhile, the teacher response questionnaire showed a percentage of 96% and was included in the very feasible category. The teacher's response questionnaire analysis showed an interesting display of neared media assisted by songs; neared media assisted by songs was easy to use, media contained appropriate materials, and media could be used repeatedly.

Evaluation Stage

The evaluation stage is the stage where all tests have been carried out on the song-assisted nearpod product that has been developed. Through learning activities that use interactive learning media, students show high enthusiasm when they see illustrations and animations in learning media. They became more enthusiastic about working on the questions and using the simulation features provided. According to students, this learning media has an attractive appearance and helps them gradually understand force material with the help of visualization images and songs to make it easier for them to remember the concept of force material. Through interactive media, nearpods, with the help of songs, also invite students to use technology-based teaching media.

Testing the use of nearpod media shows several advantages, where learning becomes more enjoyable. Learners can use it flexibly, especially through the illustration and quiz features. The evaluation stage referred to from the nearpod learning media product development model stage evaluates the product implemented in school learning. The evaluation results were obtained from suggestions and input from teachers and students that Nearpod media helps students learn the concept of force, and media can be accessed easily. The evaluation from media experts is to add the song title to the lyrics of the song force material. The evaluation from the material expert is to adjust the questions to the grid that has been made and adjust the learning objectives to highlight the use of nearpods in the science learning process. Thus, the evaluation is the last phase of the ADDIE development model.

The Nearpod application can be used in both face-to-face and online learning, as it supports direct and indirect interaction between teachers and students [22] Nearpod can transform conventional learning methods into interactive and responsive ones. The platform can be accessed through a variety of devices, both mobile phones and laptops, and allows for both independent and collaborative learning [23] The interactive features that Nearpod has make learning more interesting and participatory. Thus, nearpods have proven to be effective in improving student learning outcomes.

The learning outcomes of students have increased, which was originally in the first cycle, when the completeness of student learning was only 66.66%, increasing to 83.33% in the second cycle [24]. The increase in the graduation percentage was seen after the use of Nearpod media in the learning process.

The study revealed that the average learning outcome score of students who used Nearpod-based interactive media on excretory system material was 79.29 [25]. In contrast, students who used PowerPoint media obtained an average score of 72.06. There was a significant difference between the average learning outcomes of students who used Nearpod-based interactive media and those who used PowerPoint in the excretory system material in grade XI of SMA Negeri 8 Pontianak.

In addition, the implementation of songs positively impacts student learning outcomes [26]. This hypothesis is supported by the observed increase in the average score from 56 in the first cycle to 80 in the second cycle.

Furthermore, there has been an enhancement in student learning mastery, which has now exceeded the criteria for classical learning completeness.

Previous research has proven that song media is the right means to arouse students' ideas and interests in learning. Through songs, students will be carried away by the sound of existing words, so it is hoped that students will be able to understand learning in accordance with the theme of the song that has been determined. In addition, the use of nearpod media has also been proven effective in increasing students' interest in learning, which has been proven through previous research and this study.

The present study employed a range of statistical procedures to analyse the data, including the normality test, the paired sample t-test, and the N-gain test. The normality test was conducted to ascertain the distribution of the data. The research data exhibited a normal distribution with a pretest significance value of 0.061, and the post-test data demonstrated a significance value of 0.113. Consequently, the subsequent step was to conduct a paired sample t-test, resulting in a significance value (sig. (2-tailed)) of 0.000. This value is less than 0.05, indicating a significant increase in the students' pretest and posttest results. The N-gain value obtained was 0.7919, which is included in the high category and thus indicates that the developed Nearpod media effectively improved student learning outcomes. The effectiveness of the developed media can be seen from the increase in the force material results between the pretest and posttest.

This research combines the unity of the science learning series, The Essence of Science. This is related to the stage of student development, as reflected in the essence of science, which includes four dimensions, namely product, process, attitude, and technology [27] The essence of science as a product is a collection of research results analyzed by scientists and manifested in the form of concepts from scientific studies. The form of science as a product is facts, principles, laws, and theories [28] Science as a product means that in studying science, there are facts and laws, principles and theories that have been accepted as true [29]. Science as a product can be seen from the presentation of material in the nearpod and song lyrics related to the meaning of force and various forms that previous scientists have proven true. Science as a product contains materials including the definition of force and various forces (muscle force, friction force, magnetic force, spring force, gravitational force) along with their definition, influence, and examples of the application of these forces in life. Science as a process refers to the steps taken in exploring and understanding knowledge because science is not just a collection of facts and concepts but requires a process of finding a fact or theory that scientists then generalize [28]. Natural science as a process is manifested in the practicum steps regarding the pull and push acting on an object, the process of how the poles between magnets that attract each other attract or repel, the process of objects being attracted by magnets, the process of elongated springs because they are pulled by objects available in a nearpod integrated with Phet or gizmos, or even the steps of doing practicum related to force materials in real life using concrete objects in the process classroom learning. Students can do a force practicum process to observe the influence of force on objects, such as people pushing a table or two people pulling on objects. This process not only trains students' skills in observing and analyzing but also triggers students to have an attitude of curiosity, thoroughness, openness, honesty, and criticality, which is then called the essence of science as an attitude. These are scientific attitudes that arise during the practicum or science learning process. Scientific attitudes are those that emerge and underlie the science learning process. Scientific attitude is a character value for all those involved in science [30]

The essence of science as technology is interpreted as an application of understanding science so that it can be implemented to create or develop a simple technological work. This refers to the application of scientific methods and science concepts in daily life. In this study, it can be seen from the use of nearpod learning media that allows its use as a means of learning. In the science learning process, these four dimensions need to be raised so that students can experience a complete learning process by using a scientific attitude in understanding various natural phenomena by applying scientific procedures so that facts and scientific concepts that have been accepted for truth to be applied in daily life are obtained. The newness of this research lies in using Nearpod, which is integrated with songs to learn the essence of science, especially force materials, by virtually adding practicum components. Thus, this study examines previous findings and makes new contributions to research on the science learning process.

The development of Nearpod media integrates features such as slides, videos, songs, quizzes, open-ended questions, and virtual simulations that comprehensively evaluate students' understanding after the learning process. Through these various features, teachers can carry out various activities that use learning force material. Through the slide menu, students can be shown materials on the meaning of force, the influence of force, the forms of force, and examples of the application of force in daily life. In the essence of science, this material is called a product because it contains theoretical facts proven to be true by previous scientists.

In the nearpod, videos, songs, simulation menus or evaluation questions can also be inserted. Songs about forces and their effects on objects can help students memorize and understand the material of types of forces and examples of their application in daily life. Songs can be useful as an educational medium. Songs as an educational medium aim to teach about something. In this case, for example, when students learn force material, they use songs whose lyrics contain materials related to force so that students can easily understand and remember them. The use of quizzes and games can also increase students' motivation and interest in the learning process [31].

Nearpod also provides a virtual practicum feature regarding force materials that can be accessed through Phet or Gizmos. Virtual simulation is a website-based media designed to simulate activities in a real-life practicum in the laboratory. This virtual laboratory was created to visualize reactions that may be difficult to observe under real conditions. One of the advantages of virtual labs is that they allow students to quickly collect data in various situations. In addition, students can conduct experiments safely, especially for experiments that are risky if done in person [32].

Virtual simulations or practicums offer a cheaper solution than experiments in real laboratories that require high-cost equipment and materials. This medium allows students to simulate experiments that may be risky or require large costs. As the application of modern technology in active learning methods, virtual laboratories play a role in supporting independent learning and improving student understanding. A virtual lab is a breakthrough that is one of the alternatives to providing experience working in a laboratory to organize practicum activities. This virtual lab combines the development of information and communication technology with the theory of practicum peaks in the scope of learning. Where to run it requires additional media such as electronic devices by utilizing the availability of the internet network (online).

There are several advantages to the use of virtual laboratories; namely, there is no need to incur costs because the experimental steps are provided in software, protected from harmful materials, and minimize defects in laboratory facilities and other obstacles similar to those Kusdiastuti et al. in [30]. In addition, the use of virtual practicum can make it easier for students and teachers to obtain and convey contextual information and can support students' mastery of imaginary concepts because they see visually [30]. In addition, difficulties in obtaining practicum materials or being at risk because the materials are in a dangerous environment can be overcome with virtual practicum activities [31].

Nevertheless, the practicum is still needed in learning so that students can experience it directly to prove a scientific process. The simulation or virtual practicum here is only as supportive. The statement supports this [32] students are not always connected to the authenticity of experiments through virtual laboratory activities, so virtual experimental activities cannot completely replace the real lab. Both need each other to complement each other in the learning process.

In the practicum, a series of processes or steps are carried out, starting from preparing practicum tools and work steps, which are referred to as the essence of science as a process. Through virtual practicum and in real life, force material is a tangible manifestation of the essence of science as a process.

Furthermore, through the statement [35] his research stated that virtual laboratories can attract students' interest and stimulate curiosity, encouraging active involvement in the learning process. The active participation of students in the learning process plays an important role in improving their learning outcomes. Virtual laboratory media can attract students' interest and spark curiosity, encouraging their active involvement in learning activities. High student activity during learning has the potential to result in more optimal learning achievements. The attitudes of students that arise during the process of implementing practicum, either virtual practicum or when conducting practicum in real life, are called the essence of science as attitudes. These emerging attitudes are referred to as scientific attitudes.

Based on the results of this study, teachers are expected to consider the importance of having adequate knowledge and skills in choosing learning media that suit the needs of students. Song-assisted nearpods can be a digital-based media or means of learning force material to students. This nearpod media is a form of the essence of science as a technology. In addition, the learning media in the form of a nearpod assisted by a song entitled "Force Around Us" has high accessibility for students and can increase their interest in related subjects.

Conclusion

Nearpod as a learning medium integrated with songs was declared feasible with a 95% material expert validation assessment and 94% media expert validation to be categorized as valid. The test results for students also received a media feasibility percentage of 94% and a teacher response of 96%, so it was a very feasible criterion. Furthermore, the application of nearpod media assisted by songs before and after learning showed an increase in pretest and posttest results with paired t-test significance values of $0.000 < 0.05$, so it was proven that the media increased the results of the students' posttest. The development of Nearpod media has been proven effective in increasing student learning outcomes by comparing the average scores of pre-test and post-test *results.* This aligns with the N-gain test of 0.7919 or 79%, classified as a high category. This means that developing Nearpod media assisted by songs effectively improves the learning outcomes of grade IV students at SDN Bringin 02. The suggestions for the next research are: (1) this learning media can be used in schools to help students learn science, (2) nearpod media still needs further development, (3) familiarizing students with technology-based learning media to develop digital skills and schools facilitating adequate laptop or computer devices to support learning.

Author Contribution

This article was published with the collaboration of Aisyah Tasya Kamila, the first author, and Putri Yanuarita Sutikno, the second author. The first author's contribution includes making media, conducting research, analyzing data, and preparing manuscripts. The second author contributed in the form of media design and reviewed the results of the research article.

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