

Effectiveness of the Prof. Tito Storybook in Enhancing Student Learning in Indonesian Language and Natural Science for Fifth Grade Elementary School Students

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Abstract. This research addresses the issue of unsuitable children's storybooks influencing elementary students' thinking patterns by mirroring adult behaviors, prompting the development of the modern children's storybook "Prof. Tito: Electric Bicycle Edition" to enhance literacy and science & technology education. The specific aim is to evaluate the effectiveness of character-based and science & technology-focused storybooks in improving Indonesian and natural sciences learning among fifth-grade students. "Prof. Tito, Electric Bike Edition" explores values like cooperation, mutual assistance, and knowledge of electric bicycles, offering a moral foundation for young readers. The study highlights the storybook's role in fostering empathy and focus, while educating readers about electric bicycles in the context of Indonesian language and science. Through student evaluations, the book's efficacy was tested, showing significant learning improvements. The findings reveal a 13.49% and 12.55% increase in learning outcomes, classifying the storybook as moderately effective in enhancing learning. Overall, the research concludes that the storybook significantly contributes to improving student learning outcomes, representing an original contribution to the field.

Keywords: Children's Story Books, Characters, Literacy, Science & Technology.

1. Introduction

Character and science and technology-based children's storybooks are the result of developing learning media for elementary school students in accordance with the recommendations in the national education formula regarding character education and the application of science and technology in order to increase students' interest in learning, reading and understanding science and technology based on the character of the nation's children. One of the interesting learning media for elementary school students is story books. The need to develop children's story books for learning is based on innovation in creating learning media that is interesting for students to read. Children's story books that are in accordance with educational objectives, such as specifically literacy skills related to literacy, namely reading, writing and speaking (Iswara et al., 2021) taught from an early age (Hoyne & Egan, 2019) and natural and technological knowledge. The literacy level of Indonesian children based on the Progress International Reading Literacy Study is ranked 36th out of 40 countries (Iswara et al., 2021). The rapid development of science and technology now needs to be understood by children. One way to introduce natural knowledge is as done by (Nekitsing et al., 2019) introduced unfamiliar types of vegetables. This introduction is directly through children's literacy skills in understanding story books which in fact children are interested in reading (Bus et al., 2014)(Gede et al., 2021) (Giles & Giles, 2020) which basically gives reading books to children can improve the child's literacy skills if the child is interested in reading the book (Hoyne & Egan, 2019) (Takacs & Bus, 2018). Therefore, modern children's stories were born containing learning content such as improving Indonesian language skills and science and technology on certain topics.

1.1. Problem Statement

This research was based on the problem that several children's storybooks were considered unsuitable for elementary school students because they contained content that had a negative impact on children's thinking patterns. However, previous studies stated that storybooks as a learning media are able to improve student learning outcomes as measured by assessments and also influence attitudes/character in the long term (Bus et al., 2014). This suggests that storybooks have the potential to be valuable tools for influencing the level of knowledge and character of students. Children's stories have a plot and language style that is appropriate to the child's life, imagination, and level of thinking, and contain values that can be learned. The variety of colors, writing, and images in the story is a special attraction for elementary school students. However, some of the children's stories currently available are not in accordance with educational goals. Storybooks that do not meet educational needs influence children's thinking patterns by imitating the bad habits of adults (Johnson & Aboud, 2017). Therefore, it is important to conduct effectiveness studies to assess the impact of storybooks on student learning outcomes and character development. Effectiveness studies play a vital role in this research as they provide insights into how children's storybooks can effectively enhance both the knowledge and character of students, thereby contributing to their overall development.

1.2. Related Research

The development of children's storybooks in Indonesia which include the cultivation of literacy and science and technology characteristics for children can help parents and teachers in children's education. The work is full of moral messages through implied messages based on children's characters (Solihat & Riansi, 2018). Integrating science and technology in children's stories can increase children's knowledge and skills in technology. The development of science and technology makes big changes to everyone's lives, every individual strives to continue to develop technological literacy abilities. The flow of research into the development of children's storybooks is traced from several previous studies by looking at the methods developed from children's storybooks. First, research on the development of picture story books for grade 1 elementary school students (Kurniawati & Koeswanti, 2020), raised the theme *Pengalamanku*. The use of the Research and Development method with the stage of analyzing student characteristics, formulating learning objectives, selecting methods, media and teaching materials, involving students in learning is useful for improving students' reading skills, and evaluating the media used. The research results show that it can be said that picture story book media can improve students' reading skills. In other research (Apriliani & Radia, 2020), The development of picture stories *Asyiknya Tolong Menolong* can increase elementary school students' interest in reading. Developing a digital picture story book media entitled *Let's Love the Environment* to improve the responsible character of grade 3 elementary school students (Sari & Wardani, 2021), developed with the steps of definition, design and development. Based on the discussion, it can be concluded that digital picture storybook media to improve the responsible character of grade 3 elementary school students is very suitable to be used. The assessment of bilingual picture news book entitled *Collection of Fairy Tales with Good Characters for Children* was carried out from an intrinsic analysis perspective; theme, characters, setting, message. Linguistic elements; vocabulary (Sularti Dewanti Handayani, 2023). This collection of fairy tales is for learning. And of the 18 character values mentioned, there are only seven character values, namely honesty, discipline, tolerance, hard work, friendship/communicativeness, love of peace, and responsibility. Furthermore, regarding the suitability of this book as a learning resource, several things have been provided by this book, making it a book that provides many lessons for children, awakens children's reasoning and imagination, so that it is declared suitable to be used as a resource in learning English. Development of an illustrated news book based on cultural literacy entitled *Happy Birthday, Queen Mother* (Iswara et al., 2021).

1.3. Research Objectives

The focus of research in this article is on the effectiveness of using Prof. Tito: Electric Bicycles Edition storybook. Previous studies have found that the Prof. Tito storybook underwent validity

testing by experts and practicality testing by educators and students. Tito contains science and technology-based characters and supports the improvement of students' literacy skills, making it suitable as additional teaching material for Indonesian and natural science subjects in grade 5 Elementary School.

2. Theoretical Framework

The development of a picture storybook based on character education can significantly impact character formation among students (Turan & Ulutas, 2016), emphasizing the importance of incorporating relevant narrative theories. This study, building upon previous research endeavors, underscores the influential role of storytelling in shaping individuals' characters. Rather than delving into research methodologies, this section focuses on presenting theoretical frameworks supporting the narrative's influence on character development. The utilization of pertinent theories not only enriches the discussion but also strengthens the argument for utilizing picture storybooks as a means of character education. An exemplar of this approach is evident in the development of "Prof. Tito: Electric Bicycles Edition," a children's storybook that has successfully passed validity and practicality tests in the context of character education, is now recognized as an effective learning medium for Indonesian language and science subjects with a character education nuance.

3. Method

3.1. Research Design

The research methodology follows the Borg and Gall research and development framework for developing children's storybooks, encompassing multiple stages: information gathering, planning, target product development, trial or demonstration, revision, main demonstration, operational revision, final revision, and dissemination, and implementation (Gede et al., 2021). This study adheres closely to the Borg and Gall model (Gustiani, 2019), commencing from information collection for storybook formulation to storybook dissemination. Each stage of this process has been meticulously completed to ensure the storybooks meet the requisite criteria as educational materials. Specifically, this article evaluates the effectiveness of "Prof. Tito: Electric Bicycles Edition" in enhancing learning outcomes in Indonesian language and Science.

3.2. Participant

The research was conducted on 22 fifth-grade students at SD IT Cendekia Andalas, Padang, West Sumatra, consisting of 13 boys and nine girls aged 10-11 years.

3.3. Data Collection

The data taken to measure the level of effectiveness of books are the results of evaluations of Indonesian and natural science learning without using books and using books. The results of learning Indonesian and natural sciences before using story books are in the form of pre-test results, and the results of learning by using books are called post-test results. The learning evaluation instrument is in the form of questions related to these two subjects.

3.4. Data Analysis

The storybook effectiveness test was validated using a data processing approach of uncorrelated bivariate statistical analysis between pre-test and post-test variables. This bivariate statistical analysis aims to determine whether the two data groups differ significantly (Nuryadi, A, U, & M. Budiantara, 2017). The statistical test method used is a homogeneity test as a form of distinguishing two groups of data based on different variances and a paired independent sample T-test to differentiate two groups of data based on the variance and average of the data (Nuryadi et al., 2017; Kurniawati & Koeswanti, 2020). The following are the research stages within the scope of this article.

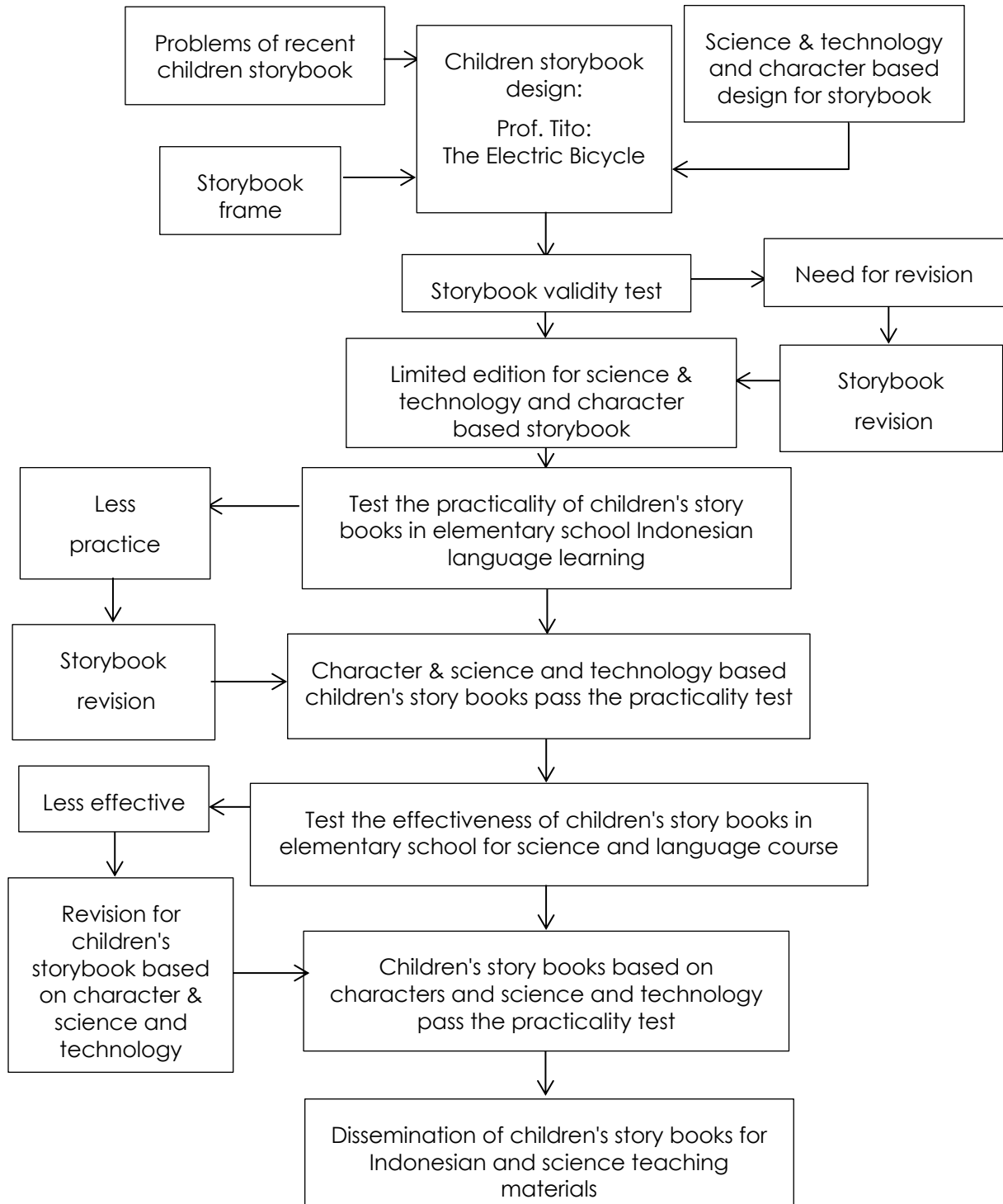


Figure 1. Research design flow diagram

An analysis of the technological elements within the story "Prof. Tito: Electric Bicycle Edition" clearly elucidates the introduction to electric bicycle technology conveyed within the children's narrative. The analyzed data unveils how the story intricately presents the concept and functionality of electric bicycles in a manner tailored to children's understanding and interests. Through the use of simple language and captivating illustrations, the story successfully immerses children in an adventure that introduces them to electric bicycle technology in a fun and educational way. This analysis highlights how the story integrates technological elements into its narrative, providing a comprehensive understanding of the basic concepts and benefits

of electric bicycle usage. In conclusion, the analysis asserts that "Prof. Tito: Electric Bicycle Edition" not only entertains but also effectively serves as a tool for introducing technology to children in an engaging and meaningful manner.

3.5. Effectiveness Test

The effectiveness of storybooks is measured by comparing two evaluation results without using storybooks and using storybooks in learning. Determining the evaluation results uses equation 1. Where n answers is the number of questions given.

$$Grade = \frac{\sum(\text{answer} \times \text{value of each answer})}{n \text{ answer} * \text{Highest Value}} \times 100 \quad (1)$$

The effectiveness of children's storybooks is measured from the results of student learning evaluations in Indonesian and science subjects when students use storybooks as a reading source. The level of effectiveness given based on the range of student learning evaluation results is a modification of the criteria for the range of learning success by students from research (Gede et al., 2021) in Table 1. Supporting data that differentiates the pre-test and post-test is the percentage increase in student learning evaluations as in the following equation.

$$\% \text{ learning evaluation increment} = \frac{\text{Posttest} - \text{Pretest}}{\text{Pretest}} \times 100\% \quad (2)$$

Table 1. Criteria for the level of effectiveness of books as student reading materials from the evaluation results (Wahab et al., 2021)

Grade (G)	Category
$85 \leq G \leq 100$	Very high
$65 \leq G < 85$	High
$55 \leq G < 65$	High enough
$35 \leq G < 55$	Low
$G < 35$	Very low

Determining the level of effectiveness empirically uses the normal gain increase test (Munifah et al., 2019) (Guntara, 2021) with following equation.

$$\text{Normal Gain} = \frac{\text{Posttest} - \text{Pretest}}{\text{Ideal score} - \text{Pretest}} \times 100\% \quad (3)$$

The level of effectiveness of learning Indonesian and natural sciences using Prof. Tito storybooks. Tito is measured based on the weight of the criteria in the normal gain test according to Table 2. The grade input in equation 3 is the average value of 22 students in the two subjects.

Table 2. Normal gain level for effectiveness (Wahab et al., 2021)

Normal Gain (NG%)	Effectivity category
$NG > 70$	High
$30 \leq NG \leq 70$	Moderate
$0 \leq NG < 30$	Low
$NG < 0$	Fail

4. Findings

4.1. Initial Obseervations

Initial observations were carried out to determine students' interest to amount of 22 grade 5 students at SD IT Cendekia Andalas. in stories by providing several points related to story books, stories, picture stories and comics. Most students liked picture stories with the adventure story genre regarding responses to interest in story books, that students liked comics more. and

legendary stories. Responses to the types of story books that elementary school students are interested in detail, from the existing story book titles, students mentioned several story books entitled *Naruto Shippuden*, *Kancil yang Bijak*, *Journey of the Prophet Muhammad*, *Si Juki*, *Ultramen Comics*, *Boboiboy Comics*, *Upin and Ipin Comics*, *Pokemon*, *Plants vs Zombie*, *Chaisaw-man*, *Science Story Book*, *The Kancil*, *One Piece*, *Doraemon*, *Hosino*, *Demons Layer*, *Chibi*, *Shinbi House*, *Omar and Hana*, *Kind Kancil*, *Hana and Hani Nisa Dear Friends*, *Anna and Elsa*, *Oshi No Ko*, *Islamic Stories*, *Stories of Little Prophets Who Have Works*, *Prayer Mats for Fathers*, *Friends Memorizing the Qur'an*, *Tokyo Revenger*, *Lutung Kasarung*, *Rawa Pening*, *Ali and Hana*, *Timun Mas Land of a Thousand Flowers*, *Gifts Mother's Birthday*, *Collection of Islamic Stories*, *25 Shabiah* and others.

Students' interest in reading picture stories and several of the stories that have been mentioned, if asked to students, there are several responses to their opinions, such as interesting story book pictures around 63.6%, exciting stories around 77.3%, funny characters around 63.6%, taught about science and technology around 45.5%, and around 68.2% responded that they liked storybooks for learning but had never used storybooks in previous learning. The stories available as a medium for learning at school are in limited quantity. Some of the existing story titles include dinosaur stories, Examples of Prophets, stories about animals such as The Mouse Deer About Friends, Characteristics of Friends, Islamic Fairy Tales, Prophet Stories Animal Stories. Through several educational stories, students responded to several opinions that students could understand learning material easily, generating curiosity and new ideas. Base on the student's interest.

4.2. Prof. Tito Story Book Display

Prof. Tito storybook is written to be easy for children to read and observe as a result of adjusting students' interest in learning which is adapted to knowledge and technology content according to the results of observations made. Prof. Tito: Electric Bicycles Edition storybook was written to be easy for children to read and observe according to children's language skills as a result of adjusting students' interest in reading and learning which is adapted to knowledge and technology content according to the results of observations made. Prof. Tito storybook display can be seen in detail in Figure 2. The story introduction explains the introduction of the characters, namely Tito as the main character and his friends named Zul, Roi, and Hana. Corresponds to the sub-story about electric bicycles. Tito's idea of assembling an electric bicycle began with Tito's sympathy for Zul, whose bicycle could no longer be used because it was damaged.



Figure 2. Prof. Tito: Electric Bicycle Edition Storybook Display

This piece of the story represents the character values of sympathy, liking new things, initiative, innovation, and the nuanced use of electrical technology for everyday life carried out by Tito to the point that his friends call him Prof. Tito for his work. The closing page contains a happy ending to the Electric Bicycle theme. This storybook confines itself to the topic of electric bicycle technology, yet in the next edition of Prof. Tito, other technological aspects will be explored. While this limitation provides an opportunity for the author to create editions based on different technologies, focusing solely on electric bicycles does not diminish readers' understanding of the topic. Additionally, feedback from readers, including book validators, teachers, and students, reveals some minor shortcomings in the storybook, such as misplaced illustrations and writing errors. Although these shortcomings are not significant, they do not substantially impact readers' reading experience.

4.3. Learning Process

Then, the process of learning Indonesian and natural sciences was carrying out according to the learning plan at each meeting. At the end of the activity, the educator provides a small evaluation as a form of pre-test intended in the research. The same learning topics in Indonesian and natural science subjects were taught again to students but the story book by Prof. Tito is done. Each student gets a story book to read and understand during learning. Students' enthusiasm can be seen when they are given learning objects that they have not had before. The topics for learning Indonesian and natural sciences are in accordance with the content in Prof. Tito: Electric Bicycles Edition storybook allows for synchronization so that student evaluations are measured again in the form of a post-test.



Figure 3. Learning Activities on Indonesian Language and Natural Science subject

4.4. Pre and Post Assesment

Learning outcomes are grouped into two data groups based on the use of Prof. Tito: Electric Bicycles Edition storybook is a form of pre-test and post-test data group. For Indonesian Language and Natural Sciences subjects. Figure 4 presents a bar diagram that differentiates the results of the pre-test and post-test evaluation of Indonesian language subjects. Meanwhile, Figure 5 presents a bar diagram that differentiates the results of the pre-test and post-test evaluation of science subjects. The differences in the value groups can be seen from the average differences for each data in Table 4.

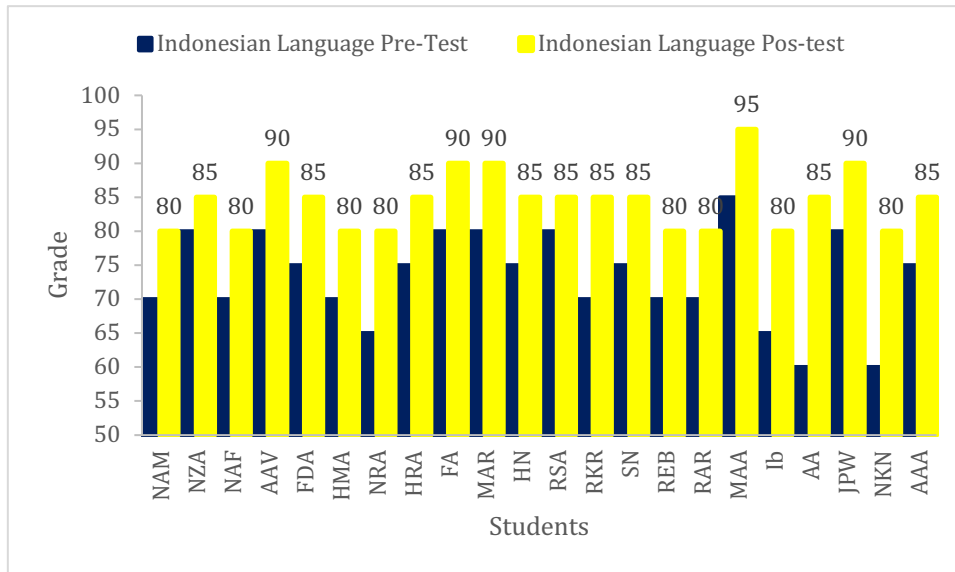


Figure 4. Pre-test and Post-test for Indonesian Language Subject

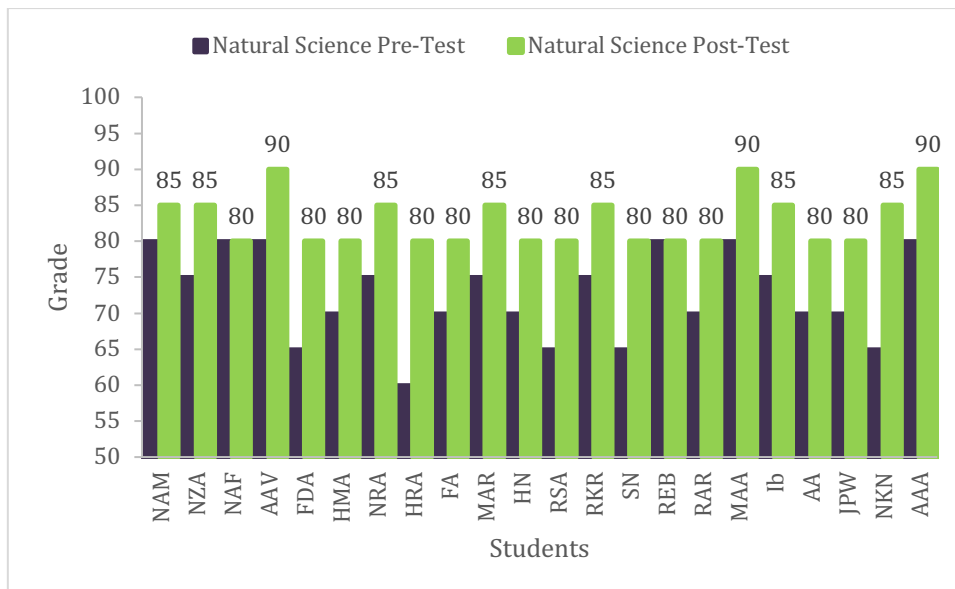


Figure 5. Pre-test and Post-test for Natural Science Subject

4.5. Prof. Tito Storybook effectivity for Learning

The homogeneity test is a starting point for testing the effectiveness of storybooks as a form of teaching material for Indonesian and natural science subjects. This test differentiates two groups of students' pre-test and post-test scores based on the level of data homogeneity. This level of homogeneity can be seen from the variance of the two groups (Nuryadi et al., 2017), The smaller the difference shows the nature of dissimilarity. One of the homogeneity testing methods is the Hartley test. The hypothesis must be determined first according to the comparison of the largest and smallest variances of several data groups to give rise to a calculated F_{max} according to equation 4. F_{max} table value is obtained from the Hartley homogeneity table. The hypothesis made is H_0 that the data group is homogeneous and H_1 that the data group is not homogeneous. Decision making if calculated $F_{max\ count} < F_{max\ table}$ then H_0 is accepted and H_1 is rejected and vice versa if calculated $F_{max\ count} > F_{max\ table}$ then H_0 is rejected and H_1 is accepted (Doni et al., 2023).

$$F_{\text{max count}} = \frac{\text{Highest variance}}{\text{Lowest variance}} \quad (4)$$

Table 3. Data homogeneity test results with Hartley method

Assessment	s^2	df	$F_{\text{max count}}$	$F_{\text{max table}}$	Sig
Indonesian Language Pre-Test	46,54	21	2,47	2,34	0,05
Indonesian Language Post-Test	18,83	21			
Natural Science Pre-Test	37,5	21	2,78	2,34	0,05
Natural Science Post Test	13,47	21			

Next, the T test for pairs of independent samples was carried out to determine the significant differences in pairs of pretest and post-test data groups quantitatively based on the mean (\bar{X}) and data variance (s^2). The hypothesis given is H_0 that there is no significant difference between the two groups of data and H_1 that there is a significant difference between the two groups of data. The comparison is the calculated T test obtained from equation 5 against the T table with a significance level of 5% and the degree of freedom for the amount of data reduced by 1. Decision making if $T_{\text{count}} < T_{\text{table}}$ then H_0 is accepted and H_1 is rejected and vice versa if $T_{\text{count}} > T_{\text{table}}$ then H_0 is rejected and H_1 is accepted (Doni et al., 2023).

$$T_{\text{count}} = \frac{\bar{G}_2 - \bar{G}_1}{\sqrt{\left(\frac{(n_2 - 1)s_2^2 + (n_1 - 1)s_1^2}{(n_2 - 1) + (n_1 - 1)}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad (5)$$

Table 4. Paired independent sample T test results

Assessment	\bar{G}	df	T_{count}	T_{table}	Sig
Indonesian Language Pre-Test	73,18	21	6,59	1,72	0,05
Indonesian Language Post-Test	84,55	21			
Natural Science Pre-Test	72,5	21	6,86	1,72	0,05
Natural Science Post Test	82,95	21			

The storybook effectiveness test is an aspect of the level of success of storybooks as a learning media for students as measured by the results of learning evaluations in Indonesian and natural science subjects. Effectiveness testing refers to the range of average learning evaluation results from 22 students according to Table 4 using equation 3. Analysis was carried out by comparing the results of the students' pre-test and post-test.

Tabel 5.

Results of testing the effectiveness of storybooks as a media for learning Indonesian and natural sciences

Subjects	Average pre-test	Average post-test	Learning evaluation increment (%)	Normal Gain value (%)	Effectivity level
Indonesian Language	73,1	84,5	13,5	42,3	Moderate Effective
Natural Science	72,5	82,9	12,5	37,8	Moderate Effective

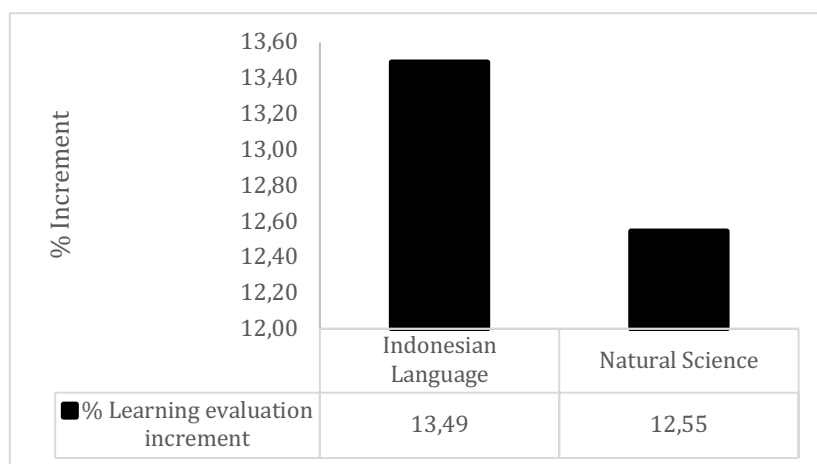


Figure 6. Comparison diagram of learning evaluation increment of Indonesian Language and natural Science Subject on pre and post-test using storybook intervention in learning

5. Discussion

The development of character and science and technology-based children's storybooks is in line with character education, as stated in Presidential Decree 87 of 2017 concerning Strengthening Character Education, which states that education strengthens the character of students through harmonization of heart, feeling, thought and sports with cooperation between educational units, families and communities. Apart from that, the development of character and science and technology-based children's storybooks is in line with PP Number 4 of 2022 concerning Amendments to PP Number 57 of 2021 concerning National Education Standards. Competency standards for graduates at the Basic Education Level Education Unit are focused on IMTAQ, character in accordance with Pancasila, literacy and numeracy. UU no. 3 of 2017 concerning Bookkeeping Systems explains that literacy can interpret information critically so that everyone can access science and technology as an effort to improve the quality of their life.

Children's story books as a form of learning media provide information to children about certain situations in the story which convey teaching interpretations that are easily absorbed by the child. The more interesting the story book is read, the more the child is carried away by the imagination of the story, in the sense that it directly influences the child's mental state. (Brophy-herb et al., 2020). It is not surprising that some characters in popular stories tend to be imitated and practiced in children's daily lives. Children's interest in storybooks from the visual, written and storyline aspects is the key to making educational children's storybooks. Children's stories in the form of printed books follow the tendency of children to read in printed story books (Danaei et al., 2020).

Prof. Tito: Electric Bicycles Edition storybook has passed validity testing by experts from linguistic and graphic aspects. Children like the pictures in story books, the better the graphics, the more interested the child is in learning effectively (Retnowati et al., 2018). Next, it has gone through a practicality test based on the results of the questionnaire responses from educators and students. This means that it has fulfilled the Indonesian language teaching materials for elementary schools in terms of language and the practicality of storybooks for reading and understanding by elementary school students with slight improvements to the image display. The content of the story in the Electric Bicycle edition is a form of natural knowledge material and the latest technology that is easy for elementary school students to understand regarding applications for the use of energy-based technology. Apart from that, there are character values that reflect the characters of Tito and his friends who value curiosity, empathy and helping each other. The combination of the content of Prof. Tito, which contains knowledge, technology and the environment, can be read by elementary school students in a children's story book in line with the content of the children's story book My Water (Ray et al., 2015) which

provides knowledge about the use of water in everyday life as well as environmental knowledge.

The success of developing storybooks based on literacy, character and science and technology as one of the teaching materials for Indonesian and science subjects is in line with the teaching materials for these two subjects. The effect of storybook intervention in learning can be seen in the significant difference between the pre-test and post-test evaluation results, proven significantly through statistical evidence. The homogeneity test gives the result that H_0 is rejected, proving that the interpretation of the two groups of data is not homogeneous and the results of the paired independent sample T test give the result that H_0 is rejected, so there is a significant difference between the pre-test and post-test data based on the paired independent sample T test. The difference in learning outcomes based on these two activities is supported by the level of increase in student learning evaluations for Indonesian and Natural Sciences of 13,49% and 12,55% respectively with the approach being effective in accordance with the effectiveness criteria of normal Gain given in table 2 and table 5. Two data This increase in evaluation shows that students tend to understand literacy better. Both literacy and technology are knowledge that is easily absorbed by children (Giles & Giles, 2020) who live in an era that is increasingly based on technology, whereas to understand the latest technology students must master literacy skills so that educators are expected to facilitate children to learn about literacy and technology where these two learnings can be carried out simultaneously (Bus et al., 2014).

6. Conclusion

The "Prof. Tito: Electric Bicycle Edition" storybook proves to be effective as a learning material for fifth-grade elementary students in Indonesian Language and Science subjects, enhancing students' learning outcomes by improving their literacy and science and technology understanding. This is evidenced by the evaluation of student learning effectiveness, classified as moderately effective. Aligned with the research objective of developing the "Prof. Tito: Electric Bicycle Edition" storybook, which specifically focuses on its effectiveness, incorporating character-building stimuli such as empathy, cooperation, and curiosity, enriched with electric bicycle technology tailored to the cognitive abilities of fifth-grade elementary students in their Indonesian language proficiency. This further clarifies that the storybook significantly contributes to enhancing student learning outcomes, particularly in improving their understanding of the Indonesian language and Science subjects.

Limitation

The effectiveness of Prof. Tito storybooks is supported by empirical research findings. However, it is important to acknowledge certain limitations in our study. While our research demonstrates its validity in enhancing learning for grade 5 elementary school students in Indonesian and natural science subjects, further investigations are needed to explore its applicability across different educational contexts and student populations. Additionally, we recommend conducting longitudinal studies to assess the long-term impact of Prof. Tito storybooks on students' learning outcomes. We express our sincere gratitude to the participants and contributors involved in this research. Lastly, we declare no conflict of interest regarding the publication of these findings.

Recommendation

Prof. children's story book. Tito can be used as a learning media for several elementary schools and it is necessary to disseminate textbooks and further research in several elementary schools. This is because the storybook had passed tests of validity, practicality and effectiveness.

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Conflict of Interest

The Authors declare that there is no conflict of interest in this research.

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