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The Role of Short Film-Based Creative Media on Understanding Financial Literacy for Achieving SDGs 4.6 Universal Literacy and Numeracy in Indonesia

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ABSTRACT

Financial literacy is one of the essential elements that must be improved to achieve the Sustainable Development Goals (SDGs) in Indonesia, particularly SDG 4.6, which targets the attainment of literacy and numeracy by 2030. This study examines the role of creative media, specifically short films, in enhancing financial literacy understanding, particularly among individuals aged 15 to 40 years. A quantitative approach was employed, utilizing a one-group pretest-posttest design with 80 respondents. Data were collected through multiple-choice and short-answer questionnaires and analyzed using the Wilcoxon Signed-Rank Test and sentiment analysis based on the Bidirectional Encoder Representations from Transformer (BERT) model. The results indicated that the short film intervention had a significant impact on participants' understanding ($p = 0.08$, $p < 0.1$), which was further validated through sentiment analysis with high model accuracy (≥ 90%). Interestingly, a slight posttest decline in self-perceived knowledge, despite improvements in behavior, suggests a metacognitive shift aligned with the Dunning-Kruger effect. Increased exposure to financial concepts likely helped participants more accurately recognize their prior misconceptions and knowledge gaps. This reflected a meaningful cognitive shift from overconfidence to self-awareness, which was essential for sustained learning and sound financial behavior. Results also confirmed that creative media could both educate and influence perception, making it a valuable approach for

improving financial literacy and supporting SDG 4.6. The findings of this study are expected to serve as a reference for stakeholders in designing similar initiatives.

Keywords
Dunning-Kruger Effect
Financial Literacy
Short Film Intervention
Statistical Test
Sustainable Development Goals (SDG 4.6)

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Introduction

The Sustainable Development Goals (SDGs) are global sustainable development goals adopted by all countries, including Indonesia, since 2015, with a target for achievement by 2030. One of the development goals is SDG 4, Quality Education, with one of its indicators being SDG 4.6, Universal Literacy and Numeracy. SDG 4.6 aims to ensure that all youth and a substantial proportion of adults achieve literacy and numeracy skills.

In today's context, literacy and numeracy not only include basic reading and numeracy skills, but have also become an urgent need in the modern era, as stated by the Financial Service Authority (FSA) of the United Kingdom in 2003 [1]. The growing diversity of goods and services in society requires individuals to become more prudent in managing their finances [2]. Moreover, rising life expectancy highlights the importance of early financial planning to ensure prosperity in old age [3]. The increasing complexity of financial markets, along with the rapid emergence of new financial products, also raises the risk of fraud and economic loss for those lacking sufficient financial understanding [4].

The increasingly complex economic conditions with various styles of financial products, multiple options available, and technology that continues to progress, make understanding financial literacy a key factor in making informed financial decisions [5]. Insufficient financial capability can lead to various risks, including financial stress, excessive debt, poor decision-making, and significant economic difficulties.

In Indonesia, the understanding of math and financial literacy still faces significant challenges. The 2022 Program for International Student Assessment (PISA) results indicate that Indonesia's achievement is among the lowest in its history of participation in PISA, comparable to the 2003 results. Only 18% of Indonesian students achieved a level 2 or higher in math competency, far below the OECD average of 69%. In fact, level 2 is the minimum threshold to be considered to have basic numeracy competence. Furthermore, PISA also noted

that almost no Indonesian students were in the top-performer category (level 5 or 6) in mathematics [6].

On the other hand, in terms of financial literacy, Indonesia's Financial Literacy Index in 2025 increased from 65.43% to 66.46%. While this increase is a positive development, the 2025 National Survey on Financial Literacy and Inclusion results indicate that there are still groups or segments of society with financial literacy levels that are below the national average. These groups include women, rural communities, adolescents aged 15-17, individuals with a maximum education level of junior high school or equivalent, and students [7]. These achievements indicate that the mastery of numeracy and financial literacy in Indonesia remains relatively low and needs to be improved immediately through appropriate and sustainable interventions.

Through the interns of Bakrie Center Foundation's Campus Leadership Program together with Yayasan Pembina Matematika dan IPA (YPMIPA), a non-profit foundation engaged in mathematics and realistic mathematics education, will take concrete steps to strengthen the understanding of numeracy and financial literacy through the *Aksi Ruang Numerasi dalam Narasi* (ARUNA) 2025 program. The program combines active discussions with experts, as well as a short film titled *Catatan Bima*, which tells the story of a young man's struggle in facing everyday financial dilemmas. The program is designed not only to introduce basic financial concepts but also to reduce math anxiety and encourage emotional engagement in understanding financial issues. Therefore, this paper aims to analyze the role of short film-based creative media as an instrument to improve financial literacy, especially in achieving SDG 4.6, to address the challenges of numeracy and financial literacy in Indonesia.

Literature Review

A. The Concept and Urgency of Financial Literacy

Nowadays, the ability to manage personal finances is becoming increasingly important, especially in the midst of an ever-evolving economic and technological situation. Financial literacy can be understood as the basic knowledge and skills necessary for managing finances, including the ability to make informed decisions that maintain a healthy and stable financial condition [8–9].

According to some experts, financial literacy encompasses not only knowing how to save and budget but also understanding financial products, future planning, and attitudes and habits in managing money [10–11]. Someone who is financially literate is usually better prepared to face economic challenges, is wiser when spending, and tends to have long-term plans such as emergency or retirement funds.

The impact of financial literacy can also be felt on a broader scale. For example, research indicates that individuals with strong financial literacy can contribute to poverty reduction and

welfare improvement, particularly in rural areas [12]. In Indonesia itself, research by Askar et al. [13] even shows that improving financial literacy is closely related to efforts to overcome poverty.

Unfortunately, the level of financial literacy among Indonesians, including university students, is still relatively low. A study found that only around 45% of university students can answer financial questions correctly, which is lower than in other countries, such as the United States and Australia [14]. This is a signal that there is still a lot of simple work that can improve financial literacy, especially among young people.

The development of the digital world has also affected the way we interact with money. In today's context, financial literacy cannot be separated from digital literacy. Many financial services are technology-based, which requires its own set of skills. Students with a good level of digital financial literacy are better able to manage their money and use digital payment tools more wisely [15]. Additionally, digital financial literacy is increasingly important, especially for vulnerable groups such as the elderly, low-income people, or those living in remote areas [16].

Some studies also show that digital literacy and financial literacy are complementary. Digital literacy encourages people to be more familiar with using technology-based financial services, while financial literacy helps them make more informed decisions [17]. It can be concluded that to achieve greater financial independence, individuals must also understand how fintech and other online financial services operate [18–19].

But in reality, the way financial literacy is delivered is often rigid or boring. In fact, a more fun approach, such as implementing an interactive gamified learning environment, can effectively engage cognitive functions and improve retention and understanding of finance [20] This means that financial literacy education must be tailored to the context of the current generation, including creative and relevant approaches.

Interestingly, there is also the role of Non-Governmental Organizations (NGOs) in promoting the importance of financial literacy, especially for individuals who have limited exposure to formal education. They go directly to the field through education and advocacy, enabling people to gain a deeper understanding of finance [21].

B. The Role of Short Film as Media

Previous research has found that the use of short films can be an effective tool for financial education. Films have the ability to serve as microsimulations that depict real-life economic problems and decisions by building empathy for characters experiencing financial problems. This visual and narrative approach helps bridge the gap in the delivery of information, making it easier to understand and apply in everyday life [22–23]. Audiovisual media have also been shown to be more effective than delivery through written narratives. This effectiveness is even stronger when accompanied by active discussions and reflection sessions that can deepen the

acceptance of financial values and concepts in participants [24–25]. A well-designed short video can tap into the emotional aspects of the audience, making financial issues more relevant and meaningful [23].

Audiovisual media, such as short films, have an advantage in terms of distribution, as they can be widely disseminated through various digital platforms and social media. This allows educational messages to reach a large-scale audience quickly and efficiently. Not only as a means of information, it is also able to adapt to the learning styles of the digital generation, making it a more inclusive and practical approach [28].

The effectiveness of this approach is reinforced by various studies. One of them is a study of 327 high school students that showed the use of videos integrating financial literacy into the economics curriculum significantly improved students' financial literacy behaviors ($F = 271.847$, $p < 0.05$) [27]. Research by Lusardi et al. also found that educational programs that engage users emotionally or physically and involve indirect experiences (such as watching narrative videos) rather than text-based or passive educational programs (such as reading narratives) are key to gaining increased financial literacy as well as confidence in financial knowledge [28].

Furthermore, Heinberg et al. demonstrated that a simple educational program, such as Five Steps, even though it is only three minutes long, can have a significant impact on increasing knowledge and self-efficacy, with the effect persisting for eight months. This study confirms that videos are more effective than written narratives in building knowledge and confidence [29]. Meanwhile, Prado et al. showed that short videos based on case studies and active responses can enhance three key components of students' financial literacy: knowledge, self-efficacy, and self-confidence. The most significant improvement occurred in the knowledge aspect, which reinforces the finding that visual simulation-based interventions and active participation can magnify the overall effectiveness of financial education [30].

C. Challenges of SDG 4.6 in Indonesia

The Sustainable Development Goals (SDGs) 4.6 aims that by 2030, all youth and a certain proportion of the adult population, both men and women, achieve adequate levels of literacy and numeracy [31]. Indonesia still faces complex challenges in achieving these targets by 2030. Several studies have shown that the quality of education and the competence of educators are the primary obstacles to improving students' literacy and numeracy skills [32–33]. Additionally, the COVID-19 pandemic and suboptimal distance learning have also exacerbated student literacy and numeracy [34]. Even before the pandemic, the 2018 Program for International Student Assessment (PISA) results had shown a low position in literacy and numeracy aspects, with the majority of high school students in the low-performer category

[35]. In PISA, Indonesia was recorded as having the lowest score in the history of comparable PISA assessments in Indonesia, dating back to 2003 [6].

Other factors that contribute to low literacy and numeracy skills include student self-efficacy, limited teaching materials, and inadequate facilities and infrastructure [36]. A study analyzing students' errors in solving literacy and numeracy problems also varied based on students' ability levels, so practical and differentiated learning strategies are needed to overcome this [37].

To overcome these challenges, the Indonesian government has taken a strategic step by replacing the National Exam with a National Assessment that focuses on literacy and numeracy, aiming to improve the quality of education [33]. In addition, local governments play a crucial role in the successful implementation of policies through funding, accountability, and institutional strengthening [38]. However, policy implementation still faces significant obstacles at the local level, especially the education gap that affects the poor, women, and remote areas [38–39]. In this context, the role of voluntary groups and philanthropic institutions is considered to be an essential component in supporting the achievement of SDGs by reducing disparities and increasing access to education [40].

Material and Methods

This study uses a quantitative method approach by applying a survey design conducted on an intervention in the form of the *Aksi Ruang Numerasi dalam Narasi* (ARUNA) 2025 program, which combines active discussions with experts and a short film entitled “Catatan Bima” with a one-group pretest-posttest design to measure the results before and after the intervention through statistical analysis of scores reinforced by participant sentiment analysis contained in the questionnaire filling section to explore the financial literacy skills of respondents in more depth towards the creative media used.

A. Research Subjects

In this study, the age group of the respondents was highlighted. Research has found that financial literacy skills are most urgently needed among individuals aged 15 to 40 [41–42]. In addition, this age group is also the time when a person makes a lot of preparations and makes various financial decisions for the first time in each age group [43] so the researcher sees an urgency to see the achievement of SDGs 4.6 in Indonesians aged 15 to 40 years, and expects a significant impact after the intervention in the form of the ARUNA 2025 program, to answer the challenges of numeracy and financial literacy in Indonesia.

The research was conducted on a specific population. Population is the entire subject, whether individuals, objects, or events, which is the main focus of a study [44]. Respondents were taken from the population used in this study, namely, all 100 participants of the ARUNA 2025 program.

B. Data Collection Method

Respondents in this study were selected using the purposive sampling technique, a method that selects participants based on specific criteria aligned with the research objectives. From the total 100 participants of the ARUNA 2025 program, a purposive sample of 80 people aged between 15 and 40 years was selected, as this age group is considered relevant in the context of measuring financial literacy, which is the focus of the research.

Respondents will complete questionnaires before and after the intervention as a research instrument. The instrument will be developed as a computer-based test with a total of 11 items that have passed the validity and reliability testing stages. Respondents will be directed to rate the first ten questions on a scale of 1-4 and one fill-in question that is considered most appropriate to the respondent's situation.

Data collection is carried out through several main stages, followed by each respondent. First, respondents filled out a pretest questionnaire to obtain basic data on their financial literacy level, which includes aspects of financial knowledge, confidence, and habits as the measurement parameters of financial literacy level set out in the National Survey of Financial Literacy and Inclusion (SNLIK) by the Financial Services Authority (OJK) of Indonesia.

The questions in the questionnaire are divided into three dimensions, which serve as parameters of financial literacy, namely Knowledge, Confidence, and Habits. These dimensions utilize a Likert scale with four levels of assessment, resulting in ordinal-type data. According to the National Survey on Financial Literacy and Inclusion (SNLIK) conducted by the Indonesian Financial Services Authority (OJK) in 2024, individuals are considered to have good financial literacy if they choose answers with a Likert scale of 3 and above [45]. This measurement score is used to compare the change in financial literacy before and after the intervention. The next stage of data collection was the intervention, where respondents followed the ARUNA 2025 program in its entirety. In the final stage, respondents were asked to complete the posttest questionnaire again, which contained the same questions as the pretest, to assess the potential changes in their financial literacy following the intervention.

C. Data Analysis

1. Descriptive Analysis

   Before the data was analyzed, data exploration and descriptive analysis were conducted on the dataset, which included basic statistical descriptions to understand the characteristics of the dataset and provide an initial understanding of the respondents' literacy levels before further statistical analysis. For multiple-choice type questionnaire variables, the descriptive analysis method used is to describe the distribution of respondents' financial literacy level scores.

Descriptive analysis for fill-in-the-blank questionnaire variables that require respondents to express their opinions about their financial challenges will use Word Cloud visualization as one of the stages before sentiment analysis. Word Cloud is a text visualization method that displays the most frequently occurring words, thus allowing researchers to get an initial overview of the data content [46]. In sentiment analysis, this visualization highlights the words that appear predominantly in positive and negative contexts, making it easier to identify sentiment trends in the data [47].

2. Data Cleaning

The data cleaning stage aims to handle data that does not meet the study's objective criteria, as well as incomplete data (missing values). The solution to overcome the problem of missing data is data imputation. In data imputation, missing values in the dataset are replaced with values calculated using standard procedures, forming a new dataset with error values [48].

The data imputation method used in this study is multiple imputation (MI). Multivariate imputation will use the Multivariate Imputation by Chained Equations (MICE) method. MICE is an imputation method that estimates missing values using the most powerful and flexible imputation method [48], so it can handle variables with various types of data that have complexities such as boundaries or blanks in a survey result [49].

The first step is to generate several imputed datasets. Then we will compare different MICE method approaches, such as Linear Regression, Random Forest Regression, and Support Vector Regression, based on the data we have, with the assumption of missing values due to Missing at Random (MAR).

3. Hypothesis Testing (Wilcoxon Signed-Rank Test)

In this study, nonparametric statistical tests were employed to address the shortcomings in the dataset, which did not meet the assumptions of the population data distribution required for analysis [50–51]. The test used is the Wilcoxon Signed Rank Test to test the specified hypothesis. This test aims to measure the impact of the ARUNA 2025 program intervention on the respondent group by comparing the pretest and posttest results.

Furthermore, this test is also used to determine changes in the level of financial literacy skills of respondents before and after the implementation of the treatment. It is used as the primary test to determine whether the intervention affects the impact of the ARUNA 2025 program as a solution to achieving SDG 4.6 in Indonesians aged 15 to 40 years, addressing literacy and numeracy challenges in Indonesia.

4. Sentiment Analysis (Multilingual BERT Model)

Sentiment analysis, also known as opinion mining, is the process of detecting a viewpoint or attitude of a text towards an individual, topic, or event that can determine polarity, an indicator that can show the direction of the emotion/sentiment of the object [52]. Sentiment analysis is part of Natural Language Processing, a branch of artificial intelligence (AI) that focuses on how computers can understand, process, and produce a human language. NLP can also be applied in various fields, including education [53].

In 2018, Devlin et al. (2018), as part of Google, introduced a new language model that can analyze the context of a word in a sentence in two directions, called Bidirectional Encoder Representations from Transformer (BERT) [54]. The Multilingual BERT (mBERT) model, introduced at the same time, is another version of the BERT model that can understand more than 100 languages, including Indonesian [55]. Thus, this model can be used to perform text mining on ARUNA 2025 pretest and posttest result data using the Indonesian language.

Below are the stages of sentiment analysis using the Multilingual BERT Model:

- Text data is manually labeled by humans for each fill-in answer [56], with categories: 2 for positive, 0 for neutral, and 1 for negative, where the quality and consistency of labeling at this stage greatly determines the final performance of the model.
- Before being fed into the model, the text data must be cleaned through several pre-processing steps, including case folding and removing noise elements such as symbols, emojis, excess spaces, URL links, and repeated characters [57].
- Once clean, sentences are broken down into smaller units called tokens. These tokens can be words or subwords recognized by IndoBERT, a file called vocab.txt containing about 30,000 tokens.
- To train and evaluate the model, the labeled dataset is divided into three parts [58]: training data (to teach the model), validation data (to monitor performance and adjust hyperparameters), and test data (to measure the final performance of the model on new data).
- Model training involves per-batch training data. The model predictions are compared with the original labels, and the difference (loss) is used to optimize the model parameters (e.g., AdamW) for improved predictions. This process is repeated for each batch for several epochs until the performance of the validation data stabilizes [59].

In the context of a person's finances, sentiment analysis can be useful for understanding the opinions, attitudes, and challenges that people have regarding issues of their internal and external financial conditions. By measuring people's attention to their

financial aspects using sentiment analysis, it is possible to understand how people's financial conditions and challenges are, thereby furthering our understanding of ARUNA 2025 program participants' knowledge of financial literacy before and after the event. In addition, this analysis can also provide a new perspective on the impact of the intervention through what they feel emotionally, which may not be captured by statistical tools.

Results and Discussions

The analysis in this study was conducted using Microsoft Excel, Google Collaboratory, and RStudio software to facilitate calculations. The results of the research and their interpretation will be explained further in the research section below.

A. Descriptive Analysis

Table 1. Demographics of ARUNA 2025 Participants

Characteristics	Category	Pre Test		Post Test	
		(n)	(%)	(n)	(%)
Age	<15	2	2.22	2	2.17
	15-24	49	54.44	50	54.35
	24+	18	20	22	23.91
	>40	21	23.33	18	19.57
Gender	Female	63	30	66	29.03
	Male	27	70	27	70.97
Status	University Students	39	43.33	38	40.86
	Students*	5	5.56	5	5.38
	General / Professional	46	51.11	50	53.76

Source: Primary data from ARUNA 2025 program internal survey (n = 90 for pretest, n = 93 for posttest)
* "Students" refers to school-age participants (non-university)

Respondents for this study were selected using the purposive sampling technique, a sampling method based on specific criteria for the research objectives, specifically individuals aged 15 to 40 years. Table 1 shows that there were 23 respondents who exceeded the criteria. Therefore, from the 93 people who filled out the questionnaire, 80 people aged between 15 and 40 years were selected, as this age group is considered relevant in the context of measuring financial literacy, which is the focus of the research.

Since not all participants completed both the pretest (n = 90) and posttest (n = 93), but many completed at least one, this study applied data imputation to estimate missing values. This approach allowed the inclusion of partial responses to maintain a larger sample size and improve the statistical robustness of the analysis. The detailed imputation process will be described in the upcoming section.

1. Multiple Choice Question Variables

The respondents were given multiple-choice questionnaires before and after the intervention to measure their level of financial literacy based on three main dimensions: Knowledge and Skills, Confidence, and Attitude and Behavior. Table 2 below shows the respondents' frequency (n) and percentage (%) for each category.

Table 2. Distribution of Financial Literacy Level of ARUNA 2025 Participants Based on Knowledge, Confidence, and Habits Dimensions

Dimension	Financial Literacy Level	Pre Test		Post Test	
		(n)	(%)	(n)	(%)
Knowledge	Low	64	13.33	97	20.21
	Good	416	86.67	383	79.79
Confidence	Low	12	7.50	13	8.13
	Good	148	92.50	147	91.88
Habits	Low	3	1.88	2	1.25
	Good	157	98.13	158	98.75

As shown in Table 2, the financial literacy level of respondents before the intervention was generally high in all dimensions of financial literacy parameters, with the highest percentage of respondents exhibiting the best financial literacy in the Attitude and Behavior (Habits) dimension. This indicates that ARUNA 2025 participants have financial goals in their daily lives and make efforts to achieve them, which is one of the parameters of an individual's good financial literacy level [45].

Increased financial literacy is correlated with improved money management skills. Individuals who have better financial literacy tend to be more prudent in saving and investing [60]. In addition, a good level of financial literacy enables individuals to manage their information, skills, attitudes, and behaviors effectively, allowing them to manage their money better and achieve their financial goals. This, in turn, encourages the development of money decision-making skills, such as budgeting, saving, and investing [61].

2. Fill-in Question Variables

Below are the results of the descriptive analysis in the form of word cloud visualizations of the results of the variable questions filled in the intervention questionnaire using the help of Google Collaboratory software.



a) Word Cloud Before Intervention b) Word Cloud After Intervention

Source: Primary Analysis from ARUNA 2025 Survey Responses

Fig. 1. Word Cloud of Financial Challenges of ARUNA 2025 Program Participants

The results of sentiment analysis related to financial challenges owned by respondents are dominated by the issue of community needs and financial conditions. Before the intervention, words such as "needs," "money," "expenses," "challenges," "emergency," "organize," "unexpected," and "wants" appeared predominantly, reflecting that the

respondents' main challenge was in managing their money to be sufficient for their emergency expenses and personal wants. Positive sentiments are seen from the use of the words "organize," "save," "important," and "consistent," which show the urgency and ability of the community in facing their financial challenges to achieve the ultimate goal of mastering financial literacy. However, negative sentiments also emerged through the words "desire," "snacks," "stuff," "online," "personal," and "lust," which reflected the presence of negative habits that contradict the respondents' financial challenges, especially in the context of refraining from spending their money on personal desires.

Whereas in the sentiment analysis results after the intervention in the form of the ARUNA 2025 program, words such as "organize," "record," "money," "should," "wise," and "important" appear more frequently than before the intervention. This may reflect that the intervention triggered respondents' awareness in identifying their financial challenges and how to address them. Prominent positive sentiments were seen from the use of words such as "should," "wise," "aware," "organize," and "priority," which indicate that after the intervention, respondents felt more aware and felt an obligation to manage their finances to achieve a secure life. However, negative sentiments are still shown by some less dominant but noteworthy words, such as "desire" and "impulsive," which reflect that the tendency to spend money to fulfill desires impulsively still remains after the intervention.

Overall, this Word Cloud visualization shows that the biggest challenges for ARUNA 2025 program participants are emergency fund management and controlling their personal desires, which have a significant reciprocal impact on the health of their financial spending and income flows. This is significantly supported by research results that the lower a person's self-control, the higher their consumptive behavior [62], where excessive consumptive behavior is proven to have a negative impact on the availability of emergency funds [63].

B. Data Cleaning and Preparation

The data cleaning stage aims to deal with missing values in the dataset due to respondents only completing one of the pretests and/or posttests. To evaluate the performance of the three MICE approach methods, we used three evaluation metrics: Mean Squared Error (MSE), Mean Absolute Error (MAE), and Coefficient of Determination (R^2).

Table 3. Evaluation Metrics of the MICE Approach Method

Model	Mean Squared Error (MSE)	Mean Absolute Error (MAE)	Coefficient of Determination (R^2)
Linear Regression	0.037	0.05	0.932
Random Forest Regression	0.019	0.04	0.967
Support Vector Regression	0.017	0.037	0.969

A regression model approach is selected based on evaluation metrics [64]. For the evaluation metric, a better model is indicated by a value close to 1. Meanwhile, for the MSE and MAE evaluation metrics, the accuracy of the imputation results will be higher if the MSE and MAE values are lower. In Table 4, the lowest MSE and MAE values and the value closest to 1 belong to the method with the Support Vector Regression model approach, so further analysis will be carried out on datasets imputed with the Support Vector Regression approach.

Although the MICE approach offers significant advantages in terms of flexibility and improved imputation results compared to other missing data handling methods, it does not consider the broader context of the dataset simultaneously, and in theory, the results may not be entirely accurate [49]. In addition, MICE may produce biased estimates if we do not assume that the dataset is missing due to MAR [64].

C. Hypothesis Testing using the Wilcoxon Signed-Rank Test

The following is the hypothesis of the Wilcoxon Signed-Rank Test:

H_0Creative media, specifically short films used as an intervention, do not significantly improve participants' understanding of financial literacy.

H_1Creative media, specifically short films used as an intervention, significantly improve participants' understanding of financial literacy.

Researchers established a 90% confidence interval, indicating a 10% margin of error and a 90% certainty that the data is not coincidental. Table 4 presents the results of the nonparametric Wilcoxon signed-rank test performed on ARUNA 2025 participants.

Table 4. Results of Hypothesis Testing

Indicator	*p*-value	Dimension	*p*-value
Financial Literacy	0.089	Knowledge	0.047
		Confidence	0.169
		Habits	0.000

As Table 4 demonstrates, the short film *Catatan Bima* effectively improved the financial literacy of ARUNA 2025 participants. This is supported by an overall significance value (*p*-value) of 0.089, which falls within the 10% margin of error. Specifically, the short film *Catatan Bima* demonstrates an improvement in the financial literacy of ARUNA 2025 participants, as measured by changes in their knowledge and habits. The most significant impact was observed in the financial attitude and behavior (habits) dimension (*p*-value = 0.000). This indicates that *Catatan Bima* not only conveyed information about basic numeracy and financial concepts but also inspired participants to develop an intention or awareness to alter their financial attitudes and behaviors.

Following *Catatan Bima,* there was a statistically significant decrease in the proportion of respondents with strong financial literacy, particularly in terms of knowledge and skills related to building financial literacy. This counterintuitive phenomenon likely isn't due to respondents

forgetting or being less intelligent. Instead, it can be explained by the Dunning-Kruger effect, where individuals transition from unconscious incompetence (being unaware of their incompetence) to conscious incompetence (being aware of their incompetence) [65]. The ARUNA 2025 program appears to have triggered this shift. Supporting this, Xin *et al.* demonstrated that individuals with lower financial literacy tend to make less accurate self-assessments and are more prone to overestimating their financial knowledge [66].

A contrasting finding was observed in confidence in building financial literacy, where no statistically significant change was detected (p-value = 0.169). This result implies that although respondents gained new knowledge and were inspired to change their financial habits, a single intervention, such as a short movie, was insufficient to build their confidence in managing their finances. In building trust, encouragement in the form of creative media alone is considered inadequate. This could be because the use of intervention methods in the form of video learning, such as watching the movie *Catatan Bima,* tends to be more passive in developing practical skills compared to individual participation in simulations that require mastery experiences involving practical applications to be better able to build their confidence [67].

Psychological aspects may play a role in shaping one's financial confidence. This aligns with the literature, which suggests that self-efficacy plays a crucial role in influencing one's emotions, thoughts, motivation, and financial behavior [68]. The knowledge acquired by respondents from the movie *Catatan Bima* lacked the necessary self-efficacy to be put into practice. Consequently, the conversion of cognitive inputs into lasting financial attitudes and behaviors failed, preventing the short film's ultimate objective from being optimally realized.

Short films, as a creative medium, have demonstrably impacted financial literacy. Notably, an individual's knowledge, skills, and confidence play a statistically significant role in differentiating their level of understanding. The relatively suboptimal results may be due to various limitations encountered during the study's design, such as time constraints that prevented the researchers from measuring a more ideal long-term impact, given that financial literacy is expected to become a habit over a prolonged period.

Although the individuals' knowledge and skills in building a person's financial literacy did not statistically increase significantly, this does not mean that creative mediums had no role at all. On the other hand, a short film as a form of creative medium could be a better start to create initial interest in the need for urgency in learning finance, which could potentially open the door for more engaging and interactive follow-up programs that could increase individuals' confidence in their daily financial habits.

D. Sentiment Analysis using Multilingual BERT

Due to differences in data types, the answers to essay questions on the questionnaire could not be analyzed using the Wilcoxon statistical test. Therefore, sentiment analysis was

performed as the final step of the inferential analysis. Sentiment analysis was conducted to capture the emotional dimension of the participants towards the movie *Catatan Bima*.

Participants self-reported their emotional responses (positive, negative, or neutral) to the short film. However, sentiment analysis was also performed to enhance objectivity and address questions like: "How does the computer detect participant emotions?" "Are positive responses more prevalent than negative ones?" and "What would the computer predict if more individuals underwent the intervention?" This method enables researchers to understand participants' emotional reactions that may not be evident in numerical or quantitative data. Examples of participant data for analysis are provided below.

Table 5. Example of Pretest-Posttest Responses as Sentiment Analysis Text Data

Participant Email	Age	Pretest Responses	Posttest Responses
luckyhake*****@gmail.com	22	The biggest challenge is being consistent in recording financial transactions, both expenses and income. Regardless of the amount, whether large or small, everything must be taken into account.	Even the smallest financial matters must indeed be considered and not overlooked. I agree with the Catatan Bima tagline that "great changes begin with small things." Today's session truly gave me very insightful perspectives to reflect on. Thank you, Aruna.
**********18040601@gmail.com	20	Ego.	Record.
shalaisyag*****@gmail.com	19	When income is less than monthly expenses.	From this event, I realized that recording finances is very necessary so that we know the amount of money coming in and going out, and we can determine spending priorities based on those records.
mutiara.agit*****@gmail.com	19	Sometimes I set aside money for savings, but unexpected needs always arise, so the saved money decreases.	Actually, we can have more money if we consistently set aside savings and avoid impulsive behavior. From this event, I realized the importance of saving.

The participant responses reveal inconsistencies in language use, grammar, and contextual clarity. To address this, we employed the Multilingual BERT (mBERT) model for sentiment classification. Sentiment was categorized into positive, negative, and neutral based on open responses from participants both before and after viewing the movie (pretest and posttest), simplifying subsequent analysis. Of the 90 responses, the data went through a sentence splitting stage (tokenization), so for the pretest and posttest, the data were 811 and 825. From the total data, 10% of the data is allocated to become testing data, ± 13.5% becomes validating data, and the remaining ± 76.5% becomes training data. This data division is the main part of machine learning training to make the model learn a pattern in the data and ensure that the model formed is a relevant model. After going through a series of sentiment analyses, the results of the model evaluation analysis are obtained as follows:

Table 6. mBERT Model Evaluation Results for Sentiment Analysis

Class	Precision		Recall		F1-Score		Support	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Neutral	0	0	0	0	0	0	**6**	**2**
Positive	0.87	1	1	1	0.93	1	**40**	**43**
Negative	1	0.95	1	1	1	0.97	**37**	**37**
Accuracy					**0.93**	**0.98**	83	82
Macro Avg.	0.62	0.65	0.67	0.67	0.64	0.66	83	82
Weighted Avg.	0.86	0.95	0.93	0.98	0.89	0.96	83	82

Post-intervention, positive sentiments significantly increased, with a greater proportion of positive over negative responses. This led to improved model prediction accuracy (from 93% to 98%) and high F1-scores (>0.9) for both positive and negative classes, indicating the model successfully captured its intended targets. Conversely, the neutral class remained undetected both before and after the intervention (F1-score = 0). This suggests participants expressed stronger (positive/negative) opinions or that the model exhibited bias towards minority data.

The sentiment analysis of the movie *Catatan Bima* reveals its impact beyond conceptual understanding, fostering positive emotions and expectations concerning financial management. While negative sentiments remained unchanged, indicating no new emotional resistance, the movie's positive sentiment shifts reinforce the Wilcoxon test results on the Habits and Knowledge dimensions. This suggests that the film not only improved understanding but also cultivated emotions supportive of behavioral intentions. Although the Confidence dimension showed no statistical significance, the emergence of positive emotions could signal initial motivation and interest, crucial for building confidence through subsequent interventions. Furthermore, the model predicts an increase in positive sentiments over negative ones with the availability of new participant data, demonstrating its ability to capture these positive feelings.

The integration of sentiment analysis in this study offers a new perspective on the emotional impact of creative media-based interventions. The predominantly positive sentiments post-intervention corroborate the assumption that the narrative approach in the form of films not only educates but also moves participants' emotions and awareness, which is an important prerequisite for sustainable changes in financial attitudes and behaviors.

E. Interpretation of Findings

Based on the four stages of analysis, ARUNA 2025's participants showed a difference in their pre-and post-program understanding of the concept of financial literacy. Interestingly, a decline was observed in the proportion of individuals with strong financial literacy within the Knowledge dimension. This suggests that as participants gain a deeper understanding of financial literacy concepts, they become more aware of their previous knowledge gaps. This phenomenon aligns with the Dunning-Kruger effect, which posits that increased knowledge

often leads individuals to recognize the gaps in what they still need to learn. This trend is a positive indicator; increased engagement with financial literacy materials leads participants to better appreciate the limitations of their prior understanding. Therefore, it is normal that the Confidence dimension has not shown a significant change in its financial management confidence.

On the other hand, the Habits dimension showed positive results, where creative-media-based interventions succeeded in sparking awareness and building participants' intention to start new financial management habits. In line with these findings, sentiment analysis also indicated that the short film and active discussion not only provided conceptual understanding but also built positive sentiments that reflected the emergence of hope, motivation, and initial interest in managing finances better.

Conclusion

From a comprehensive series of analyses, the creative medium of the short film *Catatan Bima* demonstrably contributed to a significant improvement in understanding financial literacy among participants of the *Aksi Ruang Numerasi dalam Narasi* (ARUNA) 2025 program. This conclusion is drawn from a comprehensive series of analyses. In addition, the sentiments of participants were dominated by positive perceptions with high accuracy, indicating that the short film successfully motivated participants, fostered their interest, and laid an initial foundation for understanding deeper financial literacy concepts in the subsequent intervention.

This study also provides new insights for stakeholders to consider other policy-based interventions to improve individuals' financial literacy. To generate a more sustainable impact, it is suggested to design regular activities through visual creative media education in the form of films, designed to be aired gradually, raising new issues that reflect real financial literacy conflicts in each show. This solution aims to deliver a more tangible and enhanced outcome, alongside boosting self-efficacy, an area that presented difficulties in financial literacy among ARUNA 2025 participants.

Conflict of Interest

The authors declare no conflict of interest.

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