

Using Predictive Storybooks to Foster Backward Counting: An Explanatory Sequential Study in Indonesian Kindergartens

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Abstract: *Using Predictive Storybooks to Foster Backward Counting: An Explanatory Sequential Study in Indonesian Kindergartens.* **Objectives:** This study aims to examine the effectiveness of the storybook “10 Bottles of Milk “ as a learning medium for backward counting and to explore teachers’ perceptions of its implementation. **Methods:** The study used a *mixed-methods explanatory sequential design*. Quantitatively, a pretest–posttest design was used with 150 kindergarten children from 10 institutions (A–J) in Surabaya, Indonesia, each comprising 15 children. The instrument, a backward counting test, was analyzed using the Wilcoxon Signed-Rank Test. Qualitatively, interviews were conducted with 10 prospective teachers who carried out storytelling activities using the “10 Bottles of Milk” ledger and analyzed using a theme, accompanied by a word cloud visualization (*word cloud*) to capture the dominant word concept. **Findings:** The quantitative results showed an increase of 2.66 points in the average score from the pretest to the posttest ($p < 0.001$), indicating that the storybook “10 Bottles of Milk “ had a significant effect on children’s backward counting ability. The qualitative results show that the storybook of 10 Bottles of Milk effectively makes children understand the concept of counting back from 10-1. The results of quantitative and qualitative research consistently confirm that the storybook “10 Bottles of Milk “ is an effective learning medium for backward counting in early childhood. **Conclusion:** Overall, the combination of quantitative and qualitative results indicates that the storybook “10 Bottles of Milk” is an effective learning medium for stimulating backward counting skills in early childhood. The use of predictive books with attractive visuals encourages children’s active involvement in storytelling activities and supports the development of early numeracy in kindergarten.

Keywords: mixed method, explanatory sequential, backwards counting, early childhood.

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■ INTRODUCTION

Children must coordinate three aspects of numbers in order to understand and count correctly. The first aspect of numbers is quantity, which relates to the number of objects (Van de Walle, Karp, and Bay-Williams, 2012). Children begin to explore the concept of quantity even

before they can count formally; for example, they can recognize which bowl is larger or which pile has more coins. The second aspect is verbal, which is the ability to use number words in sequence. Over time and through experience, children learn to systematically produce a standard sequence of number words, known as

a forward counting sequence (Van de Walle, Karp, and Bay-Williams, 2012). With structured training and environmental support, children will be able to use this number sequence consistently. After mastering forward counting, children also need experience with backward counting, an important strategy for understanding subtraction. The third aspect is symbolic notation, which involves recognizing, reading, and writing number symbols.

Counting backward from 10 to 1 is still rarely done in Indonesian kindergartens. The survey results show that only 7 out of 100 kindergarten teachers integrate counting step back into their teaching, while most teachers (85 out of 100) only train children to count step back from 3 to 1. In addition, a ten-year literature search on Google and Mendeley using the keywords “counting in Indonesia” found 2,259 articles on counting activities, but none discussed counting step back. In fact, the ability to count backward has various benefits, including improving speed and accuracy in memory (Koponen et al., 2018) and training children’s focus and working memory (St. Clair-Thompson, 2010). This activity is also included in the mathematics learning approach for early childhood, particularly in the subject of number sequences (Alghazo et al., 2010; Powell & Fuchs, 2012). Counting backward strengthens children’s understanding of the concepts of “more than,” “less than,” and “before,” and lays a foundation for logical thinking in mastering arithmetic operations (Alghazo et al., 2010; Koponen et al., 2016, 2018; Liu & Zhang, 2022). Counting activities can even begin in infancy through songs or simple instructions from those around them (Supartini et al., 2020). These activities do not require children to recognize number symbols; instead, they introduce number words verbally (Björklund & Reis, 2020; Syafdaningsih & Utami, 2021).

Repeated counting stimulation can accelerate children’s ability to remember number

sequences verbally (Katz-Nave et al., 2020; Maehler et al., 2019). However, children often mention numbers out of sequence. Therefore, the learning environment and the role of parents are essential in reinforcing so that children can count sequentially without skipping numbers (Bodrova & Leong, 2012). Once children can count forward fluently, they are introduced to counting backward activities (Gunderson & Levine, 2011; Schröder et al., 2022). Counting activities can be done in various fun ways, such as singing, reading counting-down storybooks, and daily activities that involve counting (Enge & Stige, 2022; Levenson et al., 2022; Zimmerman et al., 2020). If children have not mastered the ability to count sequentially, both forwards and backward, this can hinder their understanding of numbers and arithmetic (Baroody, 2006; Chikiwa et al., 2019; Fischer et al., 2020). Therefore, educators need to provide learning activities that are both interesting and meaningful. One effective approach to stimulating counting skills is through storytelling activities using large books, designed to be interactive and contextualized to children’s experiences.

Sharing stories with children is a fun and meaningful learning activity (Clemens & Kegel, 2021; Salley et al., 2022; Vallotton et al., 2023; Yuill & Martin, 2016). Research shows that interactive storytelling between teachers and children can improve communication and strengthen children’s ability to predict a story’s plot (Kiser et al., 2010). In this activity, children actively participate in guessing the story’s content and interpreting the pictures shown by the teacher (Mello, 2013; Membrive & Armie, 2021; Nguyen & Phillips, 2022). This involvement not only makes children feel cared for and happy to express their opinions, but also helps them understand number concepts more meaningfully through the context of the story (Fails et al., 2014; Pulimeno et al., 2020; Rahiem, 2021; Zhang et al., 2020). Based on this, this study was conducted to examine the effect of using the

picture book “10 Bottles of Milk” on the ability of early childhood children to count step back from 10 to 1, as well as to describe the perceptins of 10 prospective early childhood teachers regarding the potential of this picture book in stimulating children’s ability to count step back.

The use of large books in storytelling activities is an important factor that supports their success in childhood (Rizka, 2020). In kindergarten classes with more than five children, large media are needed so the illustrations in the story are clearly visible to all children. In Indonesia, most kindergartens have more than 15 children per classroom, with one teacher. This condition requires the use of large media such as big books so that learning, especially in a semicircle formation, can take place effectively and interactively. Big books help children focus on the story’s visuals, creating a collaborative and meaningful learning experience.

Research on the use of big books in Indonesia has generally focused on the development of children’s language skills (Muzdalifah & Subrata, 2022; Oktaviana et al., 2021; Rizka, 2020), while research linking it to the development of mathematics and science skills is still limited (Fatimah et al., 2022; Ikbal, 2023). Analysis of several studies reveals that the use of large books in kindergarten classrooms is still rare due to limited availability on the market and high purchase costs (Rofiah et al., 2021; Partogi, 2023). On the other hand, international research on counting step back has focused more on human health aspects (Beauchet et al., 2005, 2008; Kanno et al., 2012). In this study, the types of picture books used were categorized as type A, namely children’s books with full pictures and minimal text (Aquatika et al., 2022; Bua, 2021; Wiedarti et al., 2022), as well as prediction books, which are books with repeatable patterns of words and pictures that can be predicted (Friday et al., 2009; Linse, 2007a; Lynch, 2008). The stories in these books are closely related to

children’s daily lives (Pulimeno et al., 2020; Bus et al., 2015), telling of a family gathering at the dinner table as the number of milk bottles decreases from 10 to 1 as the pages are turned. Predictive books help stimulate children’s critical thinking skills by helping them predict subsequent events (Luckner, 1990; Maulana Restanto, 2016) and making it easier for them to remember the words and sentences in the story.

■ METHOD

Participants

Respondents in this study were 150 K3 children aged 5–6 years from 10 kindergarten institutions (A–J) in Surabaya City. Each institution has two classes, namely B1 and B2, with an average of 15 children per class; in conclusion, the total population is 300 children. The research sample was selected using a cluster sampling technique based on intact classes, comprising 150 children: 85 girls (56.7%) and 65 boys (43.3%). All the participants are children in the preoperational stage according to Piaget’s theory (2001), in which children learn through concrete experiences and visual representations.

Research Design and Procedures

This research uses a mixed-methods explanatory sequential design (quantitative followed by qualitative). The study was conducted over three months (February–April 2024). Quantitative measures taken include: 1) a pretest of backward counting ability was administered individually to each child, 2) intervention: storytelling using the big book 10 Bottles of Milk was conducted twice (once per week for two consecutive weeks) by preservice teachers in their internship classes, and 3) a posttest was administered individually to each child after the two sessions. After collecting quantitative data, the research team collected qualitative data through semi-structured interviews with 10 preservice teachers to explore their perceptions

of using the storybook for backward counting. The interviews were audio-recorded and transcribed verbatim. Ethical approval was obtained, and participation was voluntary.

Instruments

The research tools used in this study are divided into two categories: quantitative and qualitative. The quantitative tools in this study are: (a) assessment criteria for backward counting ability indicators, (b) expert validation related to the backward counting ability instrument, (c) expert validation related to the 10-bottle milk big book media, and (d) expert validation related to the feasibility criteria the four instruments validated by three experts. Meanwhile, the tools were qualitative. In this study, validation was conducted

using five semi-structured questions. Before using these quantitative and qualitative tools, researchers and the team validate three experts in early childhood education programs.

Indicators assess the instrument's ability, including representative indicators for measuring a child's back and rubric criteria based on the indicators. After obtaining the average value, the three experts related to the capability instruments count backward, and then the average value is entered into the criteria. Test calculation retreat consists of four indicators: (a) forward counting 1–10, (b) number sequencing 1–10, (c) counting backwards 10–1, (d) ordering of numbers 10–1. These indicators use a Likert scale of 1–4. The Likert scale for the four test indicators calculation step back can be seen in Table 1 below

Table 1. Criteria evaluation indicator ability counting step back

| Counting Ability Indicator | Score 1 (Undeveloped) | Score 2 (Starting to Develop) | Score 3 (Developing as Expected) | Score 4 (Very Well Developed) |
|---|---|--|---|---|
| 1. Count forward 1-10 in sequence | Not yet able to count forward in sequence, full teacher assistance | Able to count sequentially with the last 1-2 digits with the help of a teacher | Able to count sequentially, but takes a bit of time | Able to count sequentially fluently and quickly |
| 2. Recognize the sequence of numbers 1-10 in sequence | Not yet able to sort numbers, complete teacher assistance | able to sequence numbers 1-5, half of which is assisted by the teacher | Capable of sorting numbers; only 1-2 need help | Able to sort numbers 1-10 with Correct |
| 3. Count backwards completely 10-1 in sequence | Not yet able to fully count on teacher assistance | Counting backwards, half of it is assisted by the teacher | Counting backwards from 10 to 1 with 1-2 teacher assistance | Mengh count back 10-1 correctly |
| 4. Recognize the sequence of numbers 10-1 in sequence | not yet able to sequence the numbers 10-1, completely with the teacher's help | able to sort numbers backwards 5-1, half of which 10-6 with teacher assistance | Able to sort numbers backwards; only the last 1-2 numbers are assisted by the teacher | able to correctly sequence numbers backwards from 10 to 1 |

The instrument was adapted from early numeracy frameworks (Van de Walle et al., 2012). Quantitative tools: the validation expert's related capability instruments, including retreat

assessment, are assessed using a Likert scale of 1-4, where 1 = very inappropriate, 2 = inappropriate, 3 = appropriate, and 4 = very appropriate. After being assessed by three

experts, the material and the average is obtained, then the average value is connected with The value of the eligibility criteria is (1.00–1.50 = not suitable for use; 1.51–2.50 = quite suitable for use; 2.51–3.50 = suitable for use; 3.51–4.00 = very suitable for use) as in Table 2 below..

In addition, the researchers and team conducted a Validation of the Big Book media featuring 10 milk bottles with three experts. The media validation instrument indicators include four things, namely: a). content specifications, b). visuals, c). suitability to the characteristics of early childhood, and d). ease of use by children and teachers. The value scale from Big Book media validation ranges from 1-4, with 1 = very inappropriate, 2 = less appropriate, 3 = appropriate, and 4 = very appropriate. After obtaining mark validation from 3 media experts, then the average value is connected with eligibility criteria values such as validation of capability instruments counting backward, namely (1.00–1.50 = not suitable for use; 1.51–2.50 = quite suitable for use; 2.51–3.50 = suitable for use; 3.51–4.00 = very suitable for use) as in Table 2.

Table 2. Instrument eligibility criteria

| Average score | Criteria |
|---------------|--------------|
| 3.25 – 4.00 | Very Worthy |
| 2.50 – 3.24 | Worthy |
| 1.75 – 2.49 | Quite Decent |
| 1.00 – 1.74 | Not feasible |

In the context of qualitative research, the research team developed a semi-structured interview instrument. The instrument was developed based on literature on storytelling and numeracy, especially counting. It covers five basic questions, namely; 1) can the story book of 10 milk bottles make children count, 2) can the story book of 10 milk bottles help children learn to count backward, 3) is the story book of 10 milk bottles interesting for children, 4) can the story book of 10 milk bottles make children able to guess the story on the next page, especially the

numbers, and 5) the content of the story of 10 milk bottles is straightforward for children to understand. The validation of these five semi-structured questions was conducted with three early childhood education experts. Validation expert related to semi-structured question instruments for prospective teachers assessed using a Likert scale of 1-4, score 1 = very poor, 2 = less appropriate, 3 = appropriate, 4 = very appropriate. Indicators for assessing semi-structured question instruments include representative questions that describe the big book “10 bottles of milk,” which can stimulate the ability to count back by step.

After validating and ensuring the reliability of all quantitative and qualitative instruments, the next step is to conduct a pretest. This pretest will provide two treatments in the form of storytelling, using a large book and 10 bottles of milk, to 10 prospective early childhood education teachers across 10 institutions. Subsequently, posttest data will be collected. Pretest and posttest data were collected by calling the children individually. The result was done to avoid bias in the pretest and posttest results. Ten bottles of milk storytelling activities were carried out every week, specifically on Tuesdays. The pretest and posttest activities required children to count forwards and backward verbally. During the pretest, they used numbers 1-10 from plastic cards arranged in a forward and backward sequence. During the posttest, they used number cards 1-10.

Data Analysis

The research data were analyzed in two main stages: quantitative and qualitative analyses, carried out sequentially within the mixed-method explanatory sequential design. In the quantitative analysis stage, the data were in the form of pretest scores. The pretest and posttest scores of 150 kindergarten children were processed using SPSS version 27. The initial stages of analysis included the Shapiro-Wilk normality test and Levene’s homogeneity-of-variance test to assess

the distribution and homogeneity of variance of the data (Pallant, 2020). If the data were normally distributed, the pretest and posttest scores were compared using a paired-samples t-test. For data that were not normally distributed, the nonparametric Wilcoxon Signed-Rank Test was used. Further analysis was conducted to identify differences in results by gender and by children from kindergarten institutions. If the data met the assumption of normality, the independent-samples t-test was used to compare group means; if they did not, the Kruskal-Wallis test and the Mann-Whitney U test were used. (Field, 2018). The choice of this non-parametric test was considered because early childhood numeracy data is often not normally distributed (Pallant, 2020).

The next stage involved a qualitative analysis of data from semi-structured interviews with 10 prospective PAUD teachers. This analysis employed a thematic analysis approach, utilizing NVivo 14 software to facilitate coding, categorization, and the identification of main themes from the interview transcripts. The analysis process followed six stages from Clarke (2021), namely: (1) reading and understanding the data (familiarization), (2) generating initial codes (generating initial codes), (3) searching for initial

themes (searching for themes), (4) reviewing themes (reviewing themes), (5) naming and defining themes (defining and naming themes), and (6) compiling a report on the analysis results (producing the report). The analysis results were visualized as a word cloud to highlight the most frequently occurring words and concepts, thereby strengthening the interpretation of prospective teachers' perceptions of the effectiveness of the "10 Bottles of Milk" ledger in stimulating children's backward counting skills.

The final stage involved integrating quantitative and qualitative results through data triangulation to gain a more comprehensive understanding. The quantitative results demonstrated the effectiveness of the "10 Bottles of Milk" ledger in improving children's backward counting skills. In contrast, the qualitative results provided in-depth explanations of teachers' experiences and perceptions of the learning process. Integrating these two findings yielded a more comprehensive and holistic understanding of storytelling's effectiveness as a tool for early numeracy learning in early childhood education. The design flow of the mixed method explanatory sequential design big book research on 10 milk bottles can be seen in Figure 1 below;



Figure 1. Mixed-method explanatory sequential design research flow

Big Book 10 Milk Bottles

This countdown storybook was created by a research team. It consists of 10 story pages and 1 cover page. The story begins with 10 bottles of milk on a table. On the next page, the grandmother takes 1 bottle of milk and pours it into a glass. On the third page, the grandfather

takes 1 bottle of milk to pour into a glass of coffee. The story content from the first to the last page uses repetition of several words; this writing style, in the context of a storybook, falls within the category of predictive storybooks (Friday et al., 2009; Linse, 2007b; Luckner, 1990). The format of this Big Book is a desk calendar, as

previously studied by Sri Widayati and her team (Rofiah et al., 2021; Simatupang et al., 2023). Based on previous research, the use of story media, such as desk calendars, facilitates easier use by teachers, complemented by the story sentences on the back of each page of the

provided book. To ensure that teachers understand the sentences in the images presented to the child, teachers do not need to confirm the images or the writing (Rofiah et al., 2021; Simatupang et al., 2023; Triutami et al., 2022; Widayati et al., 2023).



Figure 2. Cover of the big book “10 bottles of milk”



Figure 3. Illustration of the big book “10 bottles of milk”

■ RESULT AND DISCUSSION

Quantitative Results and Discussion

Before collecting quantitative and qualitative field data, the researchers first validated the instruments with three experts in early childhood education. Regarding the validity of the three experts' ratings of the instrument's ability to count backward, the average r value is 3.67 on a scale of 4.00. Therefore, the instrument's ability to count backward is included in the very suitable for field use category. Each indicator on the instrument, which counts backward, is considered representative of backward counting abilities in early childhood and can be applied at the main data collection stage.

Next, the validation results, evaluated by three experts on the media big book and 10 bottles of milk, showed an average score of 3.92 on a scale of 4.00. This shows that the media is included in the 'Very Suitable for Use' category. This value indicates that the media have met the eligibility criteria for application in early childhood learning activities. In addition, experts found that the 10-milk-bottle-big-book is easy for children to understand, with engaging content and visuals that suit the characteristics of early childhood, and it supports counting activities through storytelling. Based on this, media validation is deemed suitable and effective for use as an interactive, fun learning tool in kindergarten.

Quantitative research data were analyzed using a nonparametric inferential statistical approach in *SPSS version 27*. This analysis aims to assess the effectiveness of the “10 Milk Bottles” Big Book media in improving children’s backward counting skills in early childhood education. The analysis stages include instrument validity and reliability tests, normality and homogeneity tests, and effectiveness tests using the Wilcoxon Signed-Rank Test because the data are not normally distributed.

Prior to primary data collection, the researcher validated the rubric and tested the instrument’s reliability at two kindergartens outside the research subjects (10 institutions). After determining the validity and reliability, a pretest was conducted at the 10 institutions by 10 prospective teachers. This was followed by two storytelling treatments involving 10 bottles of milk. The treatments were conducted once a week on Tuesdays. After the two treatments, posttest data were collected.

Furthermore, the validation results of the 10 milk bottles, big book media by three experts, showed an average score of 3.92 on a scale of

4.00, which means it is included in the ‘ Very Suitable for Use’ category. This value indicates that the media have met the eligibility criteria for application in early childhood learning activities. In addition, the experts found the 10 milk bottle big book to be easy for children to understand, with engaging content and visuals that are suitable for early childhood characteristics, and it effectively supports counting activities through storytelling. Based on this, media validation is deemed suitable and effective for use as an interactive, fun learning tool in kindergarten.

After the research instruments, both quantitative and qualitative, were deemed appropriate by three experts, the next stage was testing the validity and reliability of the instruments, particularly for the quantitative instrument. The researchers and their team involved two prospective teachers in a pretest data collection with 30 children in Group B from two kindergartens outside the main research subjects. This activity aimed to ensure the validity and reliability of the backward counting ability instrument. The results of the validity and reliability tests are presented in Tables 3 and 4 below :

Table 3. Results of the validity test of the backward counting ability instrument

| No | Indicator/Item | r_hitung | r_table (N=30; =0.05) | Signature (p) | Information |
|----|-----------------------------------|----------|--------------------------|---------------|-------------|
| 1 | Counting forward 1–10 in sequence | 0.827 | 0.361 | 0.000 | Legitimate |
| 2 | Sorting numbers 1–10 | 0.782 | 0.361 | 0.000 | Legitimate |
| 3 | Counting down 10–1 in sequence | 0.744 | 0.361 | 0.000 | Legitimate |
| 4 | Sorting numbers 10–1 | 0.737 | 0.361 | 0.000 | Legitimate |

Table 4. Results of instrument reliability test

| Testing Method | Cronbach's Alpha | Criteria | Information |
|----------------------|------------------|--------------------|---------------|
| Internal Consistency | 0.895 | ≥ 0.80 = high | Very reliable |

The reliability test results using Cronbach’s Alpha in Table 6 show $\alpha = 0.895$. This value falls within the highly reliable category. Based on tables 5 and 6, Empirical testing with 30 children outside the sample showed strong item validity (r

$= 0.737–0.827 > r_{\text{table}} = 0.361$) and high reliability (Cronbach’s $\alpha = 0.895$).

After the research instrument was found to be valid and reliable, researchers conducted a pretest, administered two treatments using a large

book of 10 milk bottles, and finally collected posttest data. Pretest data from 150 children were used. Look for normality and homogeneity. This is done to determine the next step: the data

will be tested for normality. Researchers use the formula Shapiro-Wilk test. Here, Table 5 is the result of normality using the Shapiro-Wilk test:

Table 5. Normality results using the shapiro-wilk test

| Statistical Test | Test Statistics | p-value | Conclusion |
|------------------------|-----------------|-----------|---------------|
| Shapiro-Wilk (Pretest) | W = 0.824 | p < 0.001 | Abnormal data |

The Shapiro-Wilk normality test on the pretest data yielded W = 0.824 (p < 0.001). It can be concluded that the pretest data are not normally distributed. Researchers use the Wilcoxon test to assess differences between measurements before and after the intervention, or when data are not normally distributed. Before conducting the Wilcoxon test, researchers first conduct a homogeneity test, a homogeneity test is used to test whether two or more groups of

data to be compared come from the same variance, as well as to ensure that the prerequisite assumptions for statistical analysis, such as ANOVA (Analysis of Variance) and independent t-test, are met. The main objective of conducting a homogeneity test is to ensure that the groups being tested have similar variability, thereby ensuring the validity and reliability of the statistical analysis. Table 6 shows the homogeneity test using Levene's test:

Table 6. Homogeneity test using levene's test

| Statistical Test | Test Statistics | p-value | Conclusion |
|------------------|-----------------|-----------|-------------|
| Levene's Test | F = 0.62 | p = 0.780 | Homogeneous |

The results of the homogeneity test using Levene's Test yielded an F value of 0.62 and a p-value of 0.780. Therefore, the data have homogeneous variance. The next step was to

conduct a Wilcoxon test because the data were not normally distributed, enabling a nonparametric analysis. Table 7 shows the results of the Wilcoxon Signed-Rank test.

Table 7. Results of the wilcoxon signed-rank test

| Statistics | Pretest | Posttest | Information |
|-----------------|---------|----------|-------------------------|
| Average | 10.25 | 12.91 | Increase of 2.66 points |
| Wilcoxon Test | - | - | p < 0.001 (significant) |
| Effect Size (r) | - | - | 0.84 (very large) |

The analysis showed that the average pretest score was 10.25, and the average posttest score increased to 12.91, a gain of 2.66 points. The Wilcoxon Signed-Rank test yielded a p-value < 0.001, indicating a significant difference between the pretest and posttest scores. The effect size calculation yields r = 0.84, which falls

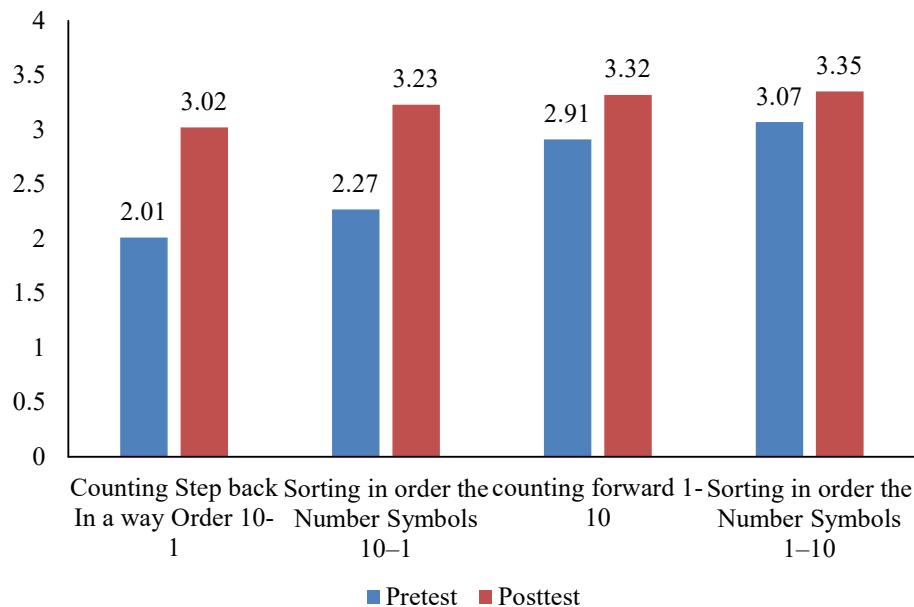
in the very large category. This proves that the use of the Big Book '10 Bottles of Milk' has a significant and strong influence on improving the backward counting ability of early childhood. In addition, researchers analyzed pretest and posttest data using four indicators of children's ability to count backwards, as shown in Table 8.

Table 8. Pretest and posttest tables per indicator

| Indicator | Pretest | Posttest | Improvement |
|--|---------|----------|-------------|
| Counting Step back In a way Order 10-1 | 2.01 | 3.02 | 1.01 |
| Sorting Number Symbols 10-1 | 2.27 | 3.23 | 0.96 |
| Moving Forward Sort 1-10 | 2.91 | 3.32 | 0.41 |
| Sorting Number Symbols 1-10 | 3.07 | 3.35 | 0.27 |

Regarding Table 8, it is evident that most indicators are increasing, with the counting indicator showing a step back in sequence 10-1, followed by an increase of 1.01, and the sorting indicator. The number symbol 10-1 increased by

0.96. While the indicator counts forward in order, 1-10, increased by 0.41, and the sorting indicator, the number symbols 1-10, increased by 0.27. Through table 8, it can be the graphic image of the increase per indicator is displayed as follows:

**Figure 4.** Comparison graph of improvement in children's arithmetic ability: step back based on indicators

Overall, the statistical test results indicate that the "10 Bottles of Milk" big book media is highly effective and significantly improves backward counting skills in young children. This improvement in ability can reflect a more meaningful learning process, as children are directly involved in counting activities within familiar story contexts. This finding supports a constructivist approach, in which children construct knowledge through relevant experiences and interactions within a fun learning

environment (Clements, 2014). This is reinforced by previous research showing that visual-story media, such as Big Books, can improve children's concentration, motivation, and understanding of numerical concepts (Khasanah & Wibaw, 2019; Oktaviana et al., 2021; Rizka, 2020). Based on this, the quantitative results of this study not only show an increase in numeracy scores but also emphasize the importance of engaging, contextual, and interactive learning media to support early childhood cognitive development.

Qualitative Results and Discussion

The qualitative analysis in this study aims to describe in depth the perceptions of prospective PAUD teachers regarding the effectiveness of the big book “10 Bottles of Milk” as a learning medium for counting backwards. Data were obtained through semi-structured interviews. A structured interview was conducted with 10 prospective teachers who had conducted storytelling activities in ten kindergartens in Surabaya. The analysis was conducted using a thematic approach (Braun & Clarke, 2021), which includes six stages: (1) reading and understanding the data, (2) coding the data, (3) grouping codes into themes, (4) reviewing the themes, (5) naming the themes, and (6) compiling the final results. The analysis was assisted by NVivo 14 to manage the interview transcripts and generate word clouds as thematic visualizations.

The interviews focused on two main questions, namely: 1. Can the 10 milk bottle story

book help children count ?, 2. Can the 10 milk bottle storybook help children learn to count backwards? Based on the coding results, four main themes were obtained: (1) children’s active involvement in counting, (2) understanding the concepts of subtraction and counting backwards, (3) learning independence and the role of teachers as facilitators, and (4) the relationship between media and children’s concrete experiences.

Before the interview, the researcher validated the semi-structured interview instrument. To three early childhood education experts. This validation aimed to ensure that each question accurately represented the desired aspect: prospective teachers’ perceptions of the effectiveness of Big Book media in stimulating children’s backward counting skills. The validation results showed an average score of 4.00 on a 1–4 scale, indicating the interview guide falls into the “very usable” category; thus, the interview guidewas deemed valid and applicable in the field.

Table 9. Results of prospective teacher interviews and thematic analysis

| Theme Main | Code Teacher | Quote Respondents (Interview Direct) | Meaning Thematic / Interpretation |
|--|--------------|--|--|
| Involvement an active child in counting | CG1 | “The student immediately follows the milk bottle count when the page is opened.” | The student was involved in the process of telling a story and counting. |
| | CG3 | "The student looks enthusiastic when saying numbers while pointing to pictures. | The student learns through experience, visual, and verbal methods simultaneously. |
| | CG7 | "The students focus more on seeing the picture, bottle reduce, and count together with friends." | Media visuals enhance students' focus and social engagement. |
| Understanding draft subtraction and counting step back | CG2 | Every page helps students understand that the amount in the bottle gradually increases. | Students begin to understand draft subtraction through a visualization story. |
| | CG9 | "Students understand that the next number is smaller because the bottle is increasingly A little smaller." | Students recognize the order by stepping back through the connection between the quantity and the symbol number. |
| | CG10 | “The bottles will reduce become 6, 5, 4, and so on.” | Students understand that counting back means reducing the amount by one at a time. |
| Independence Study and the role Teacher as facilitator | CG5 | "Students start counting independently without instructions from the teacher.” | Students demonstrate independence in Their Study and understanding of intrinsic activity counting. |
| | CG8 | "Children counting bottle milk start from page 3rd in a way | Teachers play a role as companions; children build |

| | | | |
|---|-----|--|---|
| | | independent without directions, Teacher." | understanding on their own. |
| Relatedness media with an experience concrete child | CG4 | "The picture showed similar activities of students in their daily lives. | Students feel connected to a content story because it relates to their daily lives. |
| | CG6 | One student said, 'I Also Have bottle milk like in the book.' | Experiencing connectedness personally makes learning more meaningful. |

Active Involvement of Children in Counting

Most of the prospective teachers (CG1, CG3, CG7) noted that the children were very active and enthusiastic during the storytelling activity, which utilized the 10-10 milk bottle big book. The children not only listened to the story but also counted aloud as they pointed to the milk bottle pictures on each page. This indicates that the child has a deep understanding of the story's content and is actively engaged in the counting process.

"The children immediately joined in counting the milk bottles when the page was opened." (CG1) "The children looked enthusiastic about saying the numbers while pointing at the pictures." (CG3) "The children

were more focused when they saw the picture of the bottles decreasing and joined in counting with their friends." (CG7)

This active engagement aligns with quantitative results, which show a significant improvement in counting backward from 10 to 1, with an average increase of 1.01 points. This suggests that children learn more effectively through real-life and enjoyable activities rather than just memorizing numbers. These findings align with Vygotsky's constructivist theory, which explains that children learn best through social interaction and direct experience. Stories conveyed through visual media, such as the Big Book, help children construct meaning and understand numbers in concrete, communicative contexts.

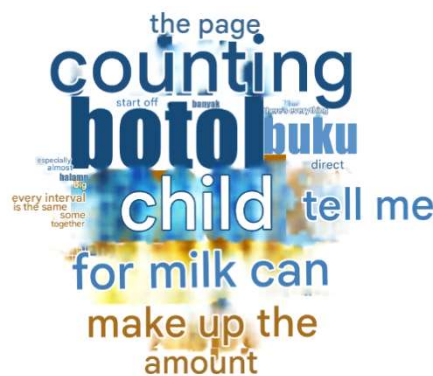


Figure 5. Book: The story of 10 bottles of milk can make children count

Figure 5. *The word cloud* visualization of the analysis of the first question ("Can the storybook of 10 milk bottles help children count?") shows the dominance of the words children, counting, bottles, and stories, which illustrates that children are focused on counting activities. (See Figure 6: *The storybook of 10 milk bottles can make children count*).

Understanding Draft Subtraction and Counting Step Back

Several pre-service teachers (CG2, CG9, CG10) observed that children began to grasp that the number of milk bottles on each page decreased. The gradually changing images helped children connect number symbols to the number of concrete objects, making it easier for them to

grasp the concepts of subtraction and a smaller number.

“Each page helps the child understand that there are fewer bottles.” (CG2). “The child knows that the next number is smaller because there are fewer bottles.” (CG9). “The bottles will decrease to 6, 5, 4, and so on.” (CG10)

Through this visual experience, children understand that counting backward means subtracting 1 from a number. This aligns with

Berch’s (2005) theory of *Number Sense*, which emphasizes the importance of a flexible understanding of numbers as the foundation for backward counting and subtraction skills. This finding also reinforces the quantitative results, indicating that the 10–1 ordering indicator increased the most among the indicators. Matter: The big books help children understand the concept of “reduction” not just through memorization, but through concrete experience as they see the bottle decrease on the book’s pages.

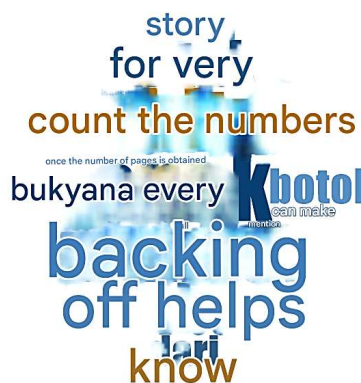


Figure 6. Book: The story of 10 bottles of milk can make children count step back

Caption for Figure 6. *The word cloud analysis of the second question (“Can the story book 10 milk bottles help children learn to count backward?”) reveals that the most frequently occurring words are subtract, bottle, number, and backward, emphasizing the children’s focus on the subtraction process. Based on quantitative and qualitative data analysis, this research shows an increase in the ability to count children’s regressions. This is evident from the results of the Wilcoxon Signed-Rank Test ($p < 0.001$). This shows that this intervention had a significant effect (See Figure 6: The story book of 10 milk bottles can make children count backwards).*

Learning Independence and the Role of Teachers as Facilitators

Prospective teachers (CG5, CG8) reported that using *the Big Book “10 Milk Bottles”* made

children more independent and less likely to wait for teacher instructions. Children began counting independently when they saw pictures of bottles without needing direction. In this case, the teacher only played a role of guidance and motivation.

“Children start counting on their own without teacher instructions.” (CG5). “Children count milk bottles starting from page 3 independently without teacher instructions.” (CG8).

Constructivist theory emphasizes that children construct their understanding through direct experience and reflection, with the teacher acting as a facilitator. Regarding quantitative results, this independence was evident in the consistent improvement in children’s numeracy skills during the post-test. Teachers no longer needed to give constant instructions because the

children already understood the flow of the activity. Storytelling activities involving 10 bottles of milk can foster self-confidence and a sense of responsibility in learning.

The Relationship Between Media and Children's Concrete Experiences

Some prospective teachers (CG4, CG6) stated that the illustrations in *the Big Book* were very relevant to children's everyday lives. This made the story feel familiar and easier for them to understand. The images, which resembled objects and activities around the home, helped children connect the story to their own experiences.

"The picture is similar to what children do at home." (CG4). *"The child said, 'I also have a milk bottle like the one in this book.'"* (CG6)

The immediacy of this experience makes children feel connected to the story, making the learning process more natural and meaningful. According to Piaget's theory (2001), preoperational children learn most effectively through concrete experiences. Seeing the changing number of bottles on each page helps children understand basic math concepts in a fun and memorable way. This finding is also in line with research by Van de Walle et al. (2012) and Siegler & Ramani (2009), which showed that visual-based learning and everyday contexts help children better understand number and subtraction concepts. Furthermore, Big Book 10 milk bottles not only help children count, but also connect mathematics with everyday life.

Integration of Quantitative and Qualitative

From Table 8 and Figure 4, it is evident that the indicator counts back and sorts numbers 10-1 more frequently than the indicators for counting forward 1-10 and ordering numbers 1-10. This signifies that a big book of 10 bottles of milk increases children's ability to count back. In

addition, the pretest and posttest data indicate that the ability to count forward affects children's ability to count backward. This shows that the forward counting indicator tends to remain stagnant (not too high) because the ability basis has been strong since the pretest. This suggests that children's strong forward counting abilities influence their basic counting abilities. Besides that, based on the results of qualitative analysis, using the theme of a can 10 milk bottle story book helps children learn to count backwards. Obtained description that Bigbook 10 milk bottles makes children count the number of milk bottles individually. Counting backwards. Based on both qualitative and quantitative findings, it can be concluded that Bigbook 10 effective milk bottles enhance the ability to count. The child's backward and forward counting abilities are influenced by their ability to count back. This means that a child who is proficient in forward counting tends to perform better at backward counting. Theoretically, this finding is in line with the theory Piaget's cognitive development theory, which emphasizes the importance of concrete experiences in the preoperational stage (2-7 years). Early childhood begins to build symbolic understanding through interactions with real objects. In this context, the visualization of a milk bottle in a large book helps children connect number representations to concrete situations, thus strengthening their understanding of backward counting. Furthermore, these findings support the theoretical framework of Number Sense, which emphasizes the importance of numerical flexibility, including backward counting as a basis for mastering subtraction. Based on the material, this study found that interventions using storytelling media not only improved short-term outcomes (test scores) but also laid the foundation for advanced mathematics skills. Story-based stimulation can strengthen understanding of number concepts such as subtraction and counting backwards (Van de Walle et al., 2012; Siegler & Ramani, 2009).

From an application perspective, the use of big books aligns with a constructivist approach, where children learn through meaningful experiences under teacher guidance. The results of interviews with 10 prospective teachers support this: they assessed that big books made children more focused, facilitated understanding of the relationship between subtraction and number, and made the learning process more enjoyable. Word cloud visualizations from interview transcripts confirmed that the most frequent words were related to the core concepts of 'children, counting, backward, help, book, milk, story'. In addition, this study aligns with previous research that emphasizes the effectiveness of big books in improving literacy and numeracy skills in early childhood. (Rahayu, 2020; Suryana, 2019) Visual storytelling media has been proven to increase children's engagement and accelerate the understanding of abstract concepts into more concrete ones.

The integration of quantitative and qualitative results shows that the storybook '10 Bottles of Milk' not only improves backward counting scores but also provides a positive and enjoyable learning experience for children. Supported by Piaget's theory, number sense, and constructivism, this medium is highly effective and suitable for teaching backward counting to young children. Furthermore, these findings support previous research that found that the use of large books has a significant impact on early reading skills and motivates children to read and learn in a fun way (Khasanah & Wibaw, 2019; Oktaviana et al., 2021; Rizka, 2020). All of these benefits automatically support children's literacy and numeracy skills (Simatupang et al., 2023).

Another finding of this study is that illustrations related to everyday life make it easier for children to understand stories and to describe the illustrations in the pictures they read (Carney & Levin, 2002; Pratami, 2020). Furthermore, illustrations related to children's daily lives encourage them to share personal experiences

without fear (Granö & Turunen, 2022). Without being prompted by the teacher, some children automatically expressed their opinions about the images they saw. This was driven by familiarity with the images and by the children's sense that they had experienced the events depicted. Furthermore, this finding aligns with previous research suggesting that everyday-life illustrations prompt children to draw on prior experiences and familiarity with the material to derive meaning. The concept of levels of meaning can provide a better understanding of how children represent and interpret visual information (Smith et al., 2021; Yu, 2009).

■ CONCLUSION

The use of the storybook "10 Bottles of Milk" has been shown to improve early childhood numeracy skills significantly. This is evidenced by an average score increase of +2.66 points and a Wilcoxon Signed-Rank Test ($p < 0.001$). Improvement in backward counting skills occurred consistently across all kindergartens (A–J) and did not differ significantly between boys and girls. Interviews with 10 prospective teachers showed that the "10 Bottles of Milk" book helped children focus better, made it easier to understand the relationship between decreasing and increasing numbers, and made learning more enjoyable. The integration of quantitative and qualitative results showed that story media not only improved children's reading skills but also helped them understand the relationships between increasing and decreasing numbers. Counting children statistically, but also reinforced meaningful learning experiences.

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