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Author Name(s): Herman Didipu, Clarina S.M. Kombu, Amelia Lamadi, Nur Asma A. Kikis

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The effect of discovery learning assisted by interactive media on students' ability to analyze short stories

Herman Didipu*), Clarina S.M. Kombu, Amelia Lamadi, Nur Asma A. Kikis
Indonesian Language and Literature Education Program, State University of Gorontalo

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ABSTRACT

This research is driven by students' limited ability to analyze short stories, due to the dominance of conventional methods and the limited use of learning media. The purpose of this research is to test the effectiveness of the Discovery Learning model, supported by interactive media (*Wordwall* and *Prezi*), in improving students' short story analysis skills. This study uses a mixed-methods approach with an embedded design, combining quantitative data from tests with qualitative data from observations and teacher field notes. The research subjects were 42 ninth-grade students from SMP Negeri 1 Tomilito, divided into experimental and control groups. The quantitative analysis showed a significant improvement in the experimental group, with a mean gain score (M = 22.19), which was much higher than in the control group (10.23 points). Qualitative findings reveal that integrating interactive media can visualize abstract literary concepts, enhance focus, and stimulate student enthusiasm through gamification, despite minor technical challenges at the outset of implementation. The implications of this research affirm that the integration of technology serves as essential scaffolding in literature learning, and provide recommendations for teachers to adopt this model as an innovative solution to enhance students' higher-order thinking skills.

Corresponding Author:

Herman Didipu,
Indonesian Language and Literature Education Program, State University of Gorontalo
Email: herman.didipu@ung.ac.id

Introduction

The ability to analyze short stories is a fundamental competence in Indonesian language learning that requires higher-order thinking skills (HOTS). Literary analysis is not just about understanding the content of the story, but also involves breaking down intrinsic elements, identifying relationships among components, and critically evaluating implied meanings (Peels, 2020; Beach et al., 2021; Ramadhana et al., 2022). Mastery of these skills is crucial for middle school students to develop deep literary literacy and critical thinking abilities that are relevant to the current curriculum demands. However, the urgency of developing these skills often encounters the reality of classroom learning that is not yet optimal.

Based on the pre-research stages conducted with Class IX students at SMP Negeri 1 Tomilito, North Gorontalo Regency, empirical findings were obtained. Most students are not yet able to analyze short stories well. This is evidenced by the low student learning outcomes in the previous short story analysis material, where more than 75% of students scored below the Minimum Completeness Criteria (KKM), which is 70. Specific data shows that the average score for Class IXA was merely 60, whereas Class IXB averaged 62. This condition aligns with Pasande's (2023) findings, which report low levels of literary analysis skills among students across regions due to the dominance of conventional teaching methods. Teachers tend to rely on lecture methods and assignments without intensive guidance, causing students to become passive and bored and to struggle to visualize abstract concepts in short stories.

To address these issues, an innovative learning model that encourages student activity in a constructivist manner is needed. The Discovery Learning model offers a solution by actively involving students in the exploration and construction of their own knowledge through the discovery process (Abrahamson & Kapur, 2018; Chase & Abrahamson, 2018; Brata et al., 2021). However, this model needs appropriate media to make abstract literary concepts more concrete. The integration of interactive media such as *Wordwall* and *Prezi* can visualize the intrinsic elements of a story in an engaging way, thereby stimulating active participation and student motivation (Hayya', 2023; Munawir et al., 2024). According to Mayer & Fiorella (2021), the combination of verbal and visual explanations in interactive multimedia significantly facilitates students' cognitive processing in understanding complex material.

Although several previous studies have examined the effectiveness of Discovery Learning, a gap remains. Amalia et al (2024) studied this model among high school students without integrating specific interactive media, while Saputri et al (2024) and Maduwu et al (2025) focused on video media for science subjects or basic concepts in elementary school. There has been little research specifically integrating Discovery Learning with a combination of Wordwall and Prezi media for short story analysis instruction at the junior high school level. The differences in location, subjects, and media combinations are what constitute the novelty of this research compared to previous studies.

Based on these problems and innovation opportunities, this study aims to examine the effect of the Discovery Learning model assisted by interactive media on students' ability to analyze short stories. This research is expected to provide practical contributions for Indonesian language teachers as an alternative innovative learning strategy, as well as theoretical contributions in the development of an effective "interactive discovery" model to enhance students' literary literacy and higher-order thinking skills in secondary schools.

Method

Research Approach and Design

This study employs a mixed-methods approach with an embedded design, in which qualitative data are collected to support and explain the quantitative experiment's results (Creswell & Plano Clark, 2018). Quantitative data is used to test the effectiveness of the treatment, while qualitative data provides context for the classroom learning dynamics.

The design of this research is quasi-experimental, with a non-equivalent control group. This design was chosen given the field limitations that prevent random student assignment. According to Cohen et al. (2018), using existing classes as a unit of analysis is natural and has high ecological validity. The experimental group received the Discovery Learning model treatment assisted by interactive media (*Wordwall* and *Prezi*), while the control group received conventional learning. Both groups were given a pretest (O1) before the treatment and a posttest (O2) after.

Table 1. Research Design Overview

Group	Pretest (O_1)	Treatment (X)	Posttest (O_2)
Experimental	O_1	X (Discovery Learning + Wordwall & Prezi)	O_2
Control	O_1	– (Conventional Learning: Lecture, Discussion, Assignment)	O_2

Population and Sample

The research population comprises all 9th-grade students at SMP Negeri 1 Tomilito (42 participants). The sample was selected using purposive sampling with the criteria: (1) ninth-grade students, (2) currently studying short story material, and (3) having basic digital access. Class IXA (21 students) was selected as the experimental group and IXB (21 students) as the control group.

To minimize selection bias due to non-randomization, an analysis of initial ability comparison was conducted. The independent t-test on the pretest scores showed no significant difference ($t(40)=1.12$; $p=0.27>0.05$), indicating that the two classes were statistically equivalent at the beginning of the study.

Research Instrument

The quantitative instrument is a short story analysis ability test (6 questions) with indicators for identifying intrinsic elements, analyzing relationships between elements, and interpreting meaning. Content validity was established by two experts in language education. A pilot test conducted in a non-sample class yielded a Cronbach's Alpha (α) reliability coefficient of 0.84, indicating high internal consistency (Hair et al., 2019).

Qualitative data were collected through two supporting instruments. First, a simple non-participant observation sheet is used to record factual data on student engagement and responses to the media during the learning process. Second, the teacher's journal was compiled to document reflections on technical constraints and student enthusiasm. The combination of these two instruments provides a contextual picture of the process of implementing the learning model.

Treatment Procedures and Media Integration

The experimental group follows six modified Discovery Learning strategies:

Step 1: Stimulation – The teacher presents a short story illustration via *Prezi*, prompting students to observe and share initial impressions.

Step 2: Problem Identification – Students identify story elements and formulate analytical questions through a *Wordwall* quiz.

Step 3: Data Collection – The story text is presented again in *Prezi*. Students read carefully and take notes on evidence for analysis.

Step 4: Data Processing – Students collaborate in groups to create an analysis chart using their notes.

Step 5: Verification – Students test the analysis results through an evaluative quiz on *Wordwall*; the teacher provides feedback.

Step 6: Generalization – The teacher and students conclude the analysis concept based on the *Prezi* summary.

Data Analysis

Quantitative data were analyzed using IBM SPSS Statistics version 29, including descriptive statistics, normality tests (Shapiro-Wilk), homogeneity tests (Levene), and hypothesis testing (paired and independent t-tests). In parallel, qualitative data from observations and field notes were analyzed thematically following the stages of data reduction, data presentation, and conclusion drawing (Miles et al., 2014). These thematic findings help contextualize the quantitative results.

Research Limitations

This study has several limitations that should be considered when interpreting the results. First, although an initial ability-equivalence test was conducted, the quasi-experimental design without perfect randomization may threaten internal validity. Second, while confounding variables such as students' economic background, intrinsic motivation, and access to technological devices at home were not strictly controlled, their impact was minimized by natural classroom conditions. Third, as the research was conducted in a single school with a limited sample, caution should be taken when generalizing the findings to a broader population. Finally, reliance on internet connectivity and school infrastructure readiness represents external factors that may affect the effectiveness of interactive media.

Results and Discussions

Quantitative Findings: Improvement in Short Story Analysis Skills

This study involved two groups: the experimental group using Discovery Learning with interactive media (*Wordwall* and *Prezi*) and the control group with regular learning. Student learning results are shown in Table 2.

Table 2. Comparison of Short Story Analysis Scores

Group	*N*	Pretest *M* (SD)	Posttest *M* (SD)	Gain Score *M*
Experimental	21	55.86 (7.87)	78.05 (5.03)	22.19
Control	21	55.48 (4.72)	65.71 (5.76)	10.23

Note. *M* = Mean; *SD* = Standard Deviation

Statistical analysis revealed a significant improvement in the experimental group compared to the control group. Table 2 shows that the mean gain score for the experimental group (M = 22.19) was much higher than for the control group (M = 10.23). An independent-samples t-test confirmed a statistically significant difference in posttest scores between the two groups, $t(40) = 7.39$, $p < 0.001$. These results indicate that the Discovery Learning model with interactive media had a greater positive impact on short story analysis than conventional instruction.

Notably, the drop in standard deviation within the experimental group, from 7.87 on the pretest to 5.03 on the posttest, suggests that integrating interactive media not only improved average performance but also narrowed the performance gap among students. This indicates a more equitable learning outcome, where lower-achieving students were able to catch up with their peers.

Qualitative Findings: Dynamics of the Learning Process

The quantitative data were complemented by qualitative data analysis from teacher observations and field notes. The thematic analysis revealed three main findings that describe the classroom dynamics during the intervention: (1) engaging concept visualization, (2) increased motivation through *gamification*, and (3) technical adaptation challenges.

1. Concept Visualization and Student Focus
   Observations during the Stimulation stage indicate that *Prezi* media visualized the abstract concepts of short stories into more concrete forms. The observer noted that "All students were focused on the *Prezi* presentation displaying animations of short story elements" (Observation Sheet, Meeting 3). This aligns with the teacher's field notes, which state, "Students admitted that they found it easier to understand the elements of the short story because the images and animations in *Prezi* clarified the explanations" (Field Notes, Meeting 1). This visualization helped students identify intrinsic elements, such as plot and characterization, more readily than in conventional settings.
2. Gamification as a Driver of Motivation
   The use of *Wordwall* in the Problem Identification and *Verification* stages corresponded with increased student engagement. Observation data show that the average score on the *Wordwall* quiz

was 85, accompanied by the note: "Students cheered quietly when the teacher opened *Wordwall*; they competed to answer each other." This behavioral shift from passive listening to active competition coincided with the higher participation rates observed during the second and third meetings.

3. Adaptation and Process Adjustment Constraints
   Despite the positive outcomes, field notes recorded implementation challenges. In the first meeting, there was a technical issue with slow Wi-Fi, which was resolved with a technical solution (tethering). Additionally, there was variation in student adaptation; the teacher's notes recorded "There are still 2–3 passive students" at the beginning of the lesson. However, this number decreased significantly in subsequent meetings as students became accustomed to the Discovery Learning process and interactive media.

Convergence of Data

Collectively, these qualitative themes provide a contextual explanation for the quantitative gains reported in Table 2. The observed improvements in student focus and engagement align with the statistical increase in test scores, suggesting a strong convergence between numerical outcomes and classroom behavior. This consistency strengthens the validity of the findings, confirming that the improvement reflected genuine changes in learning dynamics rather than merely statistical artifacts.

This study provides convergent evidence that the Discovery Learning model's success in enhancing short story analysis skills is significantly amplified when integrated with interactive media. The substantial mean gain score in the experimental group (M = 22.19) compared to the control group (M = 10.23) indicates that technology acts not merely as a supplementary tool, but as essential cognitive scaffolding. Beyond the average improvement, the reduction in standard deviation within the experimental group (from 7.87 to 5.03) suggests a critical finding: interactive media helped narrow the performance gap among students, promoting more equitable learning outcomes where lower-achieving students could catch up.

Theoretically, these findings can be explained through the lens of Mayer's Cognitive Theory of Multimedia Learning. The integration of *Prezi* during the Stimulation and Data Collection stages effectively reduced students' extraneous cognitive load. By visualizing abstract literary elements (plot, characterization) through dynamic animations, students could allocate more mental resources to higher-order thinking skills (HOTS) rather than struggling to imagine the story structure. This aligns with Mayer and Fiorella's (2021) assertion that combining visual and verbal explanations facilitates deeper cognitive processing. The qualitative data corroborate this, as students reported that *Prezi* clarified explanations that were previously abstract in conventional lectures.

Furthermore, the use of *Wordwall* during the Verification stage addressed the affective domain of learning. The high enthusiasm observed during quizzes serves as empirical evidence that *gamification* elements, such as immediate feedback and leaderboards, trigger intrinsic and extrinsic motivation. This finding extends the work of Saputri et al (2024), who noted the positive impacts of interactive video; however, this study demonstrates that interactive *quizzes* offer a distinct advantage by providing instant feedback, allowing students to correct misconceptions in real time. This mechanism explains why the experimental group's posttest mean (78.05) exceeded the findings of Amalia et al (2024), who used Discovery Learning without specific interactive media integration.

However, implementing this model is not without contextual challenges. Field notes documented initial infrastructure constraints (slow Wi-Fi) and varying student adaptation rates. These findings resonate with Anggraeni et al (2021), who identified infrastructure readiness as a determining factor in media success. Yet, the reduction of these constraints over three meetings underscores a crucial factor: teacher adaptability. The ability to pivot technically (e.g., using tethering) and pedagogically (e.g., scaffolding passive students) suggests that the success of interactive media depends on both technological stability and human management. This nuances the view that technology alone is the solution; rather, it is the synergy between robust media and flexible teaching practices that drives improvement.

Overall, the discussion underscores a pedagogical shift from passive reception to active construction. The combination of quantitative gains and qualitative engagement confirms that the

Discovery Learning model, when aided by *Wordwall* and *Prezi*, transforms the learning climate. It challenges the dominance of conventional lecture methods by providing a structured yet engaging environment where students can visualize, compete, and independently verify their understanding.

Conclusions

Quantitative and qualitative analyses indicate the Discovery Learning model, employing *Wordwall* and *Prezi*, substantially improves 9th-grade students' short story analysis skills at SMP Negeri 1 Tomilito. The experimental group exhibited a higher mean gain score (M = 22.19) than the control group (M = 10.23). Classroom dynamics reflected increased student motivation and cognitive engagement. However, several limitations warrant consideration when interpreting these findings. First, the quasi-experimental design without random assignment may threaten internal validity, although pretest equivalence analysis partially mitigated selection bias. Second, confounding variables, including socioeconomic background and intrinsic motivation, were not strictly controlled. Nevertheless, the natural classroom setting enhances ecological validity. Third, the study was confined to a single school and used a small sample (N = 42), warranting caution in generalizing the findings. Finally, the approach's effectiveness depends on stable internet infrastructure and teachers' digital proficiency, as evidenced by the initial technical hurdles. In practice, this study shows that technology should be seen as essential scaffolding for teaching literature, not just an add-on. Teachers should adopt this integrated model to turn passive classrooms into active, student-centered ones. Future studies should use multi-site designs and offline media options. This would ensure accessibility in remote locations.

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