

## THE USE OF FACTS AND DATA IN ARGUMENTATIVE WRITING INSTRUCTION USING THE GROUP INVESTIGATION MODEL FOR VOCATIONAL HIGH SCHOOL STUDENTS

Tara Jumala<sup>1\*</sup>, Syamsul Anwar<sup>2</sup> Wahyu Asriyani<sup>3</sup>

1

*Indonesian Language and Literature Education, Pancasakti University Tegal (Indonesia)*

2

*Indonesian Language and Literature Education, Pancasakti University Tegal (Indonesia)*

3

*Indonesian Language and Literature Education, Pancasakti University Tegal (Indonesia)*

Email : tarajumala91@gmail.com<sup>1</sup>

syamsulanwar590@gmail.com<sup>2</sup> asriyani1409@gmail.com<sup>3</sup>

### Abstract

This study aimed to examine the effectiveness of utilizing facts and data in improving tenth-grade students' argumentative writing skills at Muhammadiyah Kramat Vocational High School. A quantitative approach was employed using a Nonequivalent Control Group Posttest Design involving two groups. The experimental group participated in learning activities through the Group Investigation model, while the control group received conventional instruction. The research population comprised all tenth-grade students, with Class X TO-8 assigned as the experimental group and Class X TO-9 serving as the control group. Data were processed using SPSS versions 26.0 and 30.0 through a series of statistical analyses appropriate to the research design. The findings revealed a significance value of 0.000, which was below the 0.05. These findings demonstrate that the implementation of the Group Investigation model has a significant positive effect on students' argumentative writing skills and can be considered an effective instructional alternative for tenth-grade learning at Muhammadiyah Kramat Vocational High School.

Keywords: Group Investigation; writing skills; argumentative text;

## 1 INTRODUCTION

Writing is a developmental process that requires experience, time, opportunity, practice, specific skills, and direct instruction (Tarigan 2024:1). Argumentative writing is a crucial language skill in higher education and the professional world, requiring students to articulate concepts, support them with evidence, and persuade readers or listeners (Dalman 2020:137). Argumentative writing not only trains students to express opinions logically but also builds persuasion skills essential for vocational high school (SMK) graduates entering the vocational sector. However, reading and writing literacy scores reached only 359, far below the 2022 OECD PISA average of 476. This lack of proficiency is a critical issue hindering the competitiveness of national education (PISA 2022). This phenomenon is compounded by issues identified by Anwar and Azizah (2026), who state that students' poor writing skills stem from a lack of engaging teaching methods and insufficient integration of local cultural values into the learning process. The Group Investigation (GI) model represents a cooperative approach that places learners in small groups to examine a topic in depth and subsequently present their findings to the entire class. The collaborative interaction patterns within this framework foster learning motivation, strengthen social skills, and deepen mastery of the subject matter. Furthermore, the exchange of ideas and experiences among learners enriches

writing abilities through an intensive process of reciprocal learning. This perspective aligns with the findings of Slavin (2015:214).

A review of existing literature and context reveals that specific research on the Group Investigation (GI) model regarding argumentative writing skills in vocational high schools (SMK) remains limited, even though numerous studies have demonstrated the model's effectiveness in other areas. A research gap exists—particularly in settings like SMK Muhammadiyah Kramat, where vocational students face heavy practical course loads and writing proficiency is notably low. This gap stems from the absence of studies specifically exploring and measuring the effectiveness of the Group Investigation model as a teaching method designed to develop the argumentative writing abilities of Grade X students at SMK Muhammadiyah Kramat.

Preliminary observations at SMK Muhammadiyah Kramat highlight the challenges involved in developing argumentative writing skills within the vocational high school context. The

situation on the ground—specifically the identified need to improve writing skills at SMK Muhammadiyah Kramat—reflects a scenario commonly observed in many similar educational institutions. This lack of writing proficiency may stem from several factors, including a limited range of instructional approaches employed by teachers, insufficient opportunities for students to

engage actively in collaborative learning processes, and a tendency to prioritize the mechanical aspects of writing over the substance of the argument itself (Nurbaya et al., 2023). To

address these challenges, the learning process should be directed toward strategies that develop investigation outcomes through small-group collaboration. Under this mechanism, every group member participates actively—from the planning stage to the presentation of results—thereby making the learning process more meaningful and participatory.

Students exercise full control over formulating the problem, gathering information, and presenting their research findings (Slavin 2015: 214).

Several previous studies indicate that the Group Investigation model can enhance students' literacy skills and creative expression. Christiana (2022) noted that Group Investigation fosters greater student engagement and leads to superior writing performance compared to conventional models. Ulfa (2020) found that Group Investigation effectively improves academic writing skills over time. Meanwhile, Hope (2020) demonstrated that students taught using the Group Investigation (GI) model exhibited superior writing proficiency compared to those taught via an expository approach.

Based on the background information presented, this study aims to analyze the effectiveness of using facts and data to improve the argumentative writing skills of Grade X students at SMK Muhammadiyah Kramat during the 2025/2026 academic year through the implementation of the Group Investigation model. The study is expected to make both scientific and practical contributions to the development of Indonesian language instruction, particularly in enhancing the quality of argumentative writing education. In line with this objective, the proposed hypothesis states that "the implementation of the Group Investigation model is effective in improving the argumentative writing skills of Grade X students at SMK Muhammadiyah Kramat."

## **2 METHODOLOGY**

This study employs a quantitative approach using a posttest-only control group design to compare the outcomes of the treatments administered to two research groups. The study population comprises all Grade X students at SMK Muhammadiyah Kramat. A purposive sampling method was used, based on established criteria, to select class X-T08 as the experimental group and class X-T09 as the control group. Each group consists of 40 students who served as the subjects for the study.

Data collection was carried out using three techniques: tests, interviews, and documentation. Test instruments—specifically pre-tests and post-tests—were used to measure the students' argumentative writing skills both before the intervention and after the entire instructional sequence was completed. Meanwhile, interviews were conducted with students from both the experimental and control groups after the learning activities concluded. Documentation served as supporting data to complement and reinforce the information obtained through tests and interviews; it was used to observe students during the learning

process, demonstrating their active engagement in group discussions, information exchange, and collaborative task completion.

The instrument used in this study was an argumentative writing skills test. Written work was assessed using a rubric comprising eight components: title suitability, completeness of the argumentative text structure, clarity of opinion expression, strength of argumentation, use of facts and data, cohesion and coherence between ideas, accuracy of language usage, and application of spelling and punctuation. Each component was scored on a scale of 1 to 20, ensuring the resulting scores reflected the students' level of mastery in each assessed aspect. Two vocational high school (SMK) Indonesian language experts—Kartorningsih KD, S.Pd., and Taqiya Ahsanu Bintan, S.Pd.—were asked to evaluate the suitability of the assessment indicators based on the argumentation theory proposed by Dalman (2018). Validation results confirmed that all aspects were appropriate for assessing argumentative writing skills.

Inter-rater reliability testing was conducted to measure the level of agreement or consistency in assessment results between two raters regarding the same object or subject. Based on the analysis of assessment data from Rater 1 and Rater 2, a Cohen's Kappa value of 0.78 was obtained. This value indicates a "substantial" level of reliability; therefore, the assessment instrument is deemed suitable and objective for use in the study.

The data processing stage began with a verification of data characteristics to ensure the suitability of parametric analysis procedures. Data distribution conformity was evaluated using the Kolmogorov–Smirnov test, while the consistency of score variance across groups was examined using Levene's test. Both procedures yielded parameters meeting the analysis criteria, evidenced by significance values exceeding the 0.05 threshold. Based on the assessment of data characteristics, both groups exhibited distribution patterns that satisfied analysis requirements, allowing them to proceed to the subsequent testing stage. Inter-group variance levels were relatively balanced, presenting no issues that might compromise the accuracy of the comparison process. Given that these prerequisites were met, the difference in outcomes between the treatment group and the comparison group was evaluated using an independent samples t-test. All stages—ranging from raw data processing and analysis feasibility checks to the interpretation of results—were conducted using IBM SPSS Statistics versions 26.0 and 30.0 as analytical tools (Prasetya, 2025:87).

### 3 RESULTS

The research was conducted at SMK Muhammadiyah Kramat from April 20 to May 21, 2026, involving two classes: X-T08 and X-T09. Each class received a different treatment in accordance with the research design. The process began with a pre-test administered to all participants in both groups; this initial assessment aimed to gauge their baseline ability to write argumentative texts on freely chosen topics prior to the intervention. The results served as a benchmark for comparing writing skill development after the instructional process concluded. Implementation of the Group Investigation model in the experimental group began with the teacher—acting as a facilitator—presenting an orientation on the material and explaining the learning objectives. Subsequently, students were divided into six groups of six members each. Each member was assigned a distinct sub-topic to study, research, and analyze through a collaborative investigation process. Throughout the activity, the groups gathered information, discussed their findings, formulated arguments based on the obtained facts and data, and integrated each member's contributions into a cohesive discussion.

The subsequent stage involved presenting the investigation results to the class. Each group presented its findings and prepared arguments, followed by a session for questions, feedback, and inter-group discussion. The teacher facilitated the discussion, reinforced the concepts being studied, and clarified any arguments that were inaccurate. Upon completion of the entire learning sequence, both groups took a post-test—utilizing the same format and assessment indicators—to evaluate differences in argumentative writing skills following the intervention.

Unlike the experimental group, learning activities in the control group followed a conventional format dominated by direct instruction from the teacher. The material focused on understanding the fundamental concepts of argumentative texts, including their purpose,

structural components, and relevant linguistic conventions. During this process, students received explanations, examined sample texts, and completed exercises under teacher guidance, without the investigative stages or collaborative work utilized in the experimental group. Upon completion of the instructional sequence for both groups, a final assessment was conducted using a post-test with identical instruments and grading criteria. The resulting data served as the basis for comparing argumentative writing proficiency between the two groups, thereby enabling an empirical evaluation of the effectiveness of the Group Investigation model relative to the conventional teaching approach.

This step is necessary because satisfying the assumption of a normal distribution is a prerequisite for testing the research hypotheses. The data distribution was evaluated using the Shapiro–Wilk procedure via SPSS version 26.0. According to Hajaroh and Raehanah (2021), this assessment aims to determine the extent to which the data distribution aligns with the characteristics of a normal distribution. Consequently, the results of this verification serve as the basis for determining the subsequent stages of analysis.

### 3.1 STATISTICAL ANALYSIS

#### 3.1.1 Data Normality Test

Interpretation of the data distribution test results indicates that the pretest scores for both the experimental and control groups met the assumption of normality. This is evidenced by significance values that were entirely above the 0.05 acceptance threshold—specifically 0.092 and 0.200, respectively. The final data processing results indicate that the post-test score distributions for both groups were analyzed for normality. The statistical output shows significance values of 0.200 and 0.004; consequently, there is a discrepancy between the interpretation and the figures presented. Once the data distribution characteristics were established through this stage, the analysis proceeded to an examination of the homogeneity of variance. This procedure aimed to assess whether the score variability across the compared groups exhibited a sufficient level of similarity to satisfy one of the prerequisites for parametric analysis.

**Table 1. Data Normality Test**

| Class                | Data group | kolmogrov-Smirnova |       | Information normality |
|----------------------|------------|--------------------|-------|-----------------------|
|                      |            | Statistic          | Sig.  |                       |
| Investigasi on Group | Pretest    | 0,129              | 0,92  | Normal                |
|                      | Posttest   | 0,114              | 0,200 | Normal                |
| Conventional         | Pretest    | 0,073              | 0,200 | Normal                |
|                      | posttest   | 0,147              | 0,004 | No                    |

#### 3.1.2 Homogeneity Test

The output of the test for equality of variances regarding posttest scores between the experimental and control groups indicates that the "Based on Mean" parameter yielded a significance value of 0.266. This value exceeds the 0.05 threshold, indicating that score variances across both groups are relatively equal—thereby satisfying the assumption of homogeneity. Meeting these requirements—specifically regarding appropriate data distribution and variance uniformity—provides a sufficient basis to proceed with analysis using a parametric approach. All calculations were performed using IBM SPSS Statistics version 30.0, and the test outputs are presented in the following section:

Based on the decision-making criteria for parametric testing, the null hypothesis ( $H_0$ ) is retained only if the probability value exceeds 0.05. Conversely, a value below this threshold indicates a statistically significant difference between the groups being compared. Based on these results, the research hypothesis is empirically supported. In other words, the implementation of the Group Investigation model has a significant impact on students' argumentative writing skills compared to conventional instruction.

A comparison of final scores for argumentative writing skills reveals that the experimental group's mean achievement surpassed that of the control group. To ensure that this difference did not occur by chance, an Independent Samples t-test was conducted. The statistical output yielded a significance value of 0.000, which is below the 0.05 significance level. These findings confirm that the difference in post-test scores between the two groups is statistically significant, indicating a distinct difference in learning outcomes between the experimental and control groups.

**Tabel 2. Homogeneity Test**

| Class               | Levene Statistic | Sig.  | Information   |
|---------------------|------------------|-------|---------------|
| Investigation Group | 13,708           | 0,000 | Heterogeneous |
| Conventional        | 1,257            | 0,266 | homogeneous   |

### 3.1.3 Uji Samples t-Test

The comparison of results presented in the table reveals a difference in mean scores between the two groups, with the experimental group outperforming the control group. This trend indicates that the implementation of the Group Investigation model contributes positively to improving students' argumentative writing skills. However, the difference in means alone is insufficient to draw a conclusion; therefore, inferential statistical testing is required.

**Table 3. average post-test scores for argumentative writing skills**

| Class      | N  | Posttest |               |               |                |
|------------|----|----------|---------------|---------------|----------------|
|            |    | Mean     | Minimum value | Maximum value | Std. Deviation |
| Experience | 40 | 82.0     | 68            | 92            | 6,031          |
| Control    | 40 | 77,0     | 57            | 88            | 7,844          |

To determine whether the observed difference truly reflects the effect of the treatment rather than mere random variation, an analysis was conducted using the Independent Samples t-test technique. The output of this test is presented in the following table:

**Table 4. Uji Samples t-Test**

| ne's test (sig.) | t        | df | sig.  | Mean difference |
|------------------|----------|----|-------|-----------------|
| 0.308            | 27,15845 | 58 | 0,000 | 12,033          |

Based on these results, the null hypothesis was rejected, while the research hypothesis received empirical support. In addition to utilizing quantitative data, this study was supported by information gathered through interviews and documentation, providing a more comprehensive overview of the impact of the Group Investigation model on various aspects of argumentative writing skills. Participants found the learning atmosphere more engaging, as every member had the opportunity to discuss, exchange ideas, and deepen their understanding through interaction with groupmates. This collaborative process also fostered confidence in expressing opinions, given that the ideas to be incorporated into the argumentative text first received input, clarification, and reinforcement from other group members. Information obtained through documentation corroborated these findings. Throughout the learning process, students appeared actively engaged in every stage of the activity—ranging from group formation, information gathering from diverse sources, and the

investigation process to discussions for constructing fact- and data-based arguments and the final presentation of results.

The accumulated analysis results demonstrate that implementing the Group Investigation model yields superior outcomes in argumentative writing proficiency compared to the instructional approach used with the comparison group. This difference is reflected not only in the final results but also in the students' more active engagement throughout the learning activities. These findings confirm that the Group Investigation model makes a tangible contribution to developing the argumentative writing skills of Grade X students at SMK Muhammadiyah Kramat, making it a strategy worthy of consideration as an effective teaching method. The results indicate that instruction prioritizing investigation, collaboration, and the exchange of ideas fosters a more meaningful learning process, thereby supporting the development of the ability to construct arguments that are logical, systematic, and grounded in facts and data.

These findings support Slavin's (2015) theory, which posits that Group Investigation is a cooperative learning model wherein students collaboratively plan and execute investigations or projects in small groups. Students exercise full control over the entire process—from formulating the problem and gathering information to presenting their findings. As a cooperative learning model, Group Investigation is well-suited for teaching argumentative writing, as it enables students to develop their knowledge through inquiry and group discussion (Hope, 2020). Furthermore, the implementation of the Group Investigation model aligns with the learner-centered and diverse learning approaches of the (Independent Curriculum). Consequently, Group Investigation serves as a viable option for teaching writing.

#### 4 CONCLUSIONS

Based on the overall analysis, it can be concluded that the implementation of the Group Investigation model yields more optimal results in enhancing the argumentative writing skills of Grade X students at SMK Muhammadiyah Kramat. This effectiveness is evidenced by the difference in learning outcomes between the group receiving the treatment and the comparison group. This difference is corroborated by the independent samples t-test results, which show that the experimental group achieved a mean post-test score of 82.0, whereas the control group obtained a mean of 77.0. These findings indicate that the Group Investigation model has a positive impact on improving argumentative writing skills, a conclusion further supported by data from interviews and documentation. Interview results reveal that students generally showed greater interest in lessons utilizing the Group Investigation (GI) model. Students stated that group-based learning fostered more active participation, created a dynamic rather than monotonous learning environment, and facilitated the acquisition and processing of information. Furthermore, the investigation and group discussion activities helped students develop ideas and structure arguments, thereby simplifying the process of writing argumentative texts. Documentation also demonstrated that students were more enthusiastic and active during Group Investigation lessons. Therefore, the Group Investigation model can be adopted as a viable option for teaching argumentative writing within the Indonesian Language curriculum at the vocational high school (SMK) level.

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