

Comparing students' text-writing skills in module-based and web-based Student Teams Achievement Division (STAD)

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Received: April 23, 2026

Revised: July 27, 2026

Accepted: July 31, 2026

KEYWORDS

Kurikulum
Merdeka
Module-Based
Learning
STAD
Text-Writing Skills
Web-Based
Learning

ABSTRACT

Writing instruction in Indonesian language classrooms requires students to develop ideas, organize genre-specific structures, and use appropriate linguistic features across print and digital environments. Previous studies on Student Teams Achievement Division (STAD) have largely examined it as a cooperative-learning intervention, with limited attention to how different instructional media shape writing outcomes within the same STAD framework. This study compared module-based and web-based STAD for tenth-grade students' writing of observation report, exposition, and anecdote texts. A quantitative quasi-experimental comparative design involved 70 students from two Grade X classes at SMA Negeri 3 Padang, with 35 students in each instructional condition. Students' texts were assessed using an analytic rubric covering content development, generic structure, and linguistic features. Data were analyzed using descriptive statistics, Welch's *t* test, the Mann-Whitney *U* test, and effect sizes. The module-based group obtained an overall mean of 76.06 (SD = 6.46), whereas the web-based group achieved 80.85 (SD = 5.61). The overall difference was significant, $t(66.69) = 3.31$, $p = .001$, $d = .79$. Web-based STAD also showed significant advantages in observation report and anecdote writing, whereas the difference in exposition writing was not significant. These findings indicate that instructional-media effects within STAD are genre-sensitive. The study demonstrates that cooperative writing outcomes may depend on the alignment between instructional media and genre-specific writing demands.

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Introduction

Indonesian language education in senior high school is expected to develop students' ability to construct and communicate ideas through various forms of text, including digital environments. Although PISA 2022 assesses reading rather than writing, only approximately 25% of Indonesian students attained Level 2 or above in reading, indicating persistent challenges in the broader literacy environment in which writing instruction occurs (OECD, 2023). This concern remains relevant under the current curriculum, which emphasizes logical, critical, and creative communication across print and digital media. Although the present data were collected during Curriculum 2013, its genre-based emphasis remains relevant because students are still expected to develop ideas, organize text structures, and use linguistic features according to communicative purposes.

Writing is increasingly understood as both a cognitive and socially situated activity involving planning, textualization, reviewing, interaction, feedback, and revision (Flower & Hayes, 1981; Hyland, 2003; Graham, 2018). Contemporary research further emphasizes that these processes can be socially mediated through

peer interaction and collaborative problem solving. A scoping review of 107 studies in first-language school contexts shows that collaborative writing supports idea negotiation, text production, feedback, and revision (Svenlin & Sørhaug, 2023), while meta-analytic evidence indicates benefits for writing quality and linguistic accuracy compared with individual writing (Elabdali, 2021). In the present context, preliminary observations showed recurring difficulties in developing ideas, organizing observation reports, exposition texts, and anecdotes, maintaining cohesion, selecting appropriate diction, constructing effective sentences, and applying writing mechanics. These difficulties indicate the need for learning designs that provide both structured guidance and opportunities for interaction.

Student Teams Achievement Division (STAD) offers such a structure by combining heterogeneous teamwork with individual accountability. A second-order meta-analysis of 23 meta-analyses reported a moderate positive effect of cooperative learning on student outcomes, although effects varied across educational levels, disciplines, and instructional conditions (Öztürk, 2023). Previous studies have also reported benefits of STAD and cooperative learning for achievement and writing skills (Resmi et al., 2020; Yusuf et al., 2019), with more recent research indicating improvements in writing performance, participation, and group responsibility (Karnedi, 2025; Mantra et al., 2025; Tafonao et al., 2025). However, these studies generally treat STAD as the main instructional intervention rather than examining how different media operate within the same STAD framework.

This distinction is important because printed modules and web-based environments provide different forms of scaffolding. Modules offer stable and sequential guidance through objectives, explanations, examples, exercises, and writing procedures, whereas web-based environments provide more flexible access to resources, online discussion, feedback, and revision. Different face-to-face, online, and blended collaborative-writing environments can generate different interaction patterns and learning opportunities (Lu & Kim, 2021), while timely online feedback may support writing development and revision (Lv et al., 2021). Technology-supported collaborative writing has also been associated with improved writing achievement, metacognitive activity, and co-regulation (Teng, 2021), and a systematic review of 113 studies shows that digital technologies shape access to resources, peer interaction, meaning negotiation, and collaborative text construction (Zhang et al., 2021).

Nevertheless, technology-mediated collaborative-writing research remains concentrated largely in second language and post-secondary contexts (Wang, 2023; Zhang et al., 2021), while research in first-language school settings is comparatively limited at the upper-secondary level and rarely focuses explicitly on technology (Svenlin & Sørhaug, 2023). Research on STAD likewise tends to compare it with conventional instruction or apply it to a single subject or writing task. Consequently, direct comparisons between printed module-based and web-based environments within the same cooperative-learning structure remain limited, particularly in first-language writing at the senior-high-school level.

The novelty of this study lies in holding STAD constant while comparing two instructional media: module-based and web-based STAD across three Indonesian text genres: observation report, exposition, and anecdote. This design isolates instructional media as the primary distinguishing condition and extends previous STAD research from single-treatment effectiveness toward a media-sensitive, cross-genre comparison of writing performance. Accordingly, this study addresses the following research question: Do students taught through module-based STAD and web-based STAD differ significantly in their overall text-writing skills and in their performance in writing observation report, exposition, and anecdote texts? The study provides empirical evidence on the role of instructional media within structured cooperative writing instruction and offers practical considerations for selecting print and digital resources in Indonesian language learning.

Method

Research Design and Participants

This study employed a quantitative quasi-experimental comparative design involving two intact Grade X classes. Individual random assignment was not feasible; therefore, naturally occurring groups were compared with cautious interpretation of causal effects (What Works Clearinghouse [WWC], 2022). Both groups received the same Student Teams Achievement Division (STAD) cooperative-learning structure, while the instructional medium differed: one group used printed modules and the other web-based materials. The study was conducted at SMA Negeri 3 Padang during the 2017/2018 academic year. Two classes were purposively selected based on their relatively comparable academic characteristics and the absence of previous STAD-based writing instruction. The final analytic sample consisted of 70 students, with 35 students in the module-based STAD group and 35 students in the web-based STAD group. Each student completed writing tasks representing three genres: observation report, exposition, and anecdote.

Instructional Treatments

Both instructional conditions followed the principal stages of STAD, consisting of teacher presentation, team study, individual task completion, assessment, and group recognition. The groups addressed the same writing genres and learning objectives, while the primary difference concerned the instructional medium used to support the STAD activities. In the module-based STAD group, students used printed modules containing learning objectives, explanations of text concepts, model texts, writing procedures, exercises, and assessment criteria. The module provided structured and sequential guidance during team discussion and individual writing activities. In the web-based STAD group, students accessed instructional materials, text examples, and learning activities through web-based resources. The digital environment also provided opportunities for accessing materials, exchanging ideas, and revising texts within a technology-supported learning setting. Previous studies indicate that different collaborative-writing environments may generate different patterns of interaction and learning opportunities (Lu & Kim, 2021), while online feedback and digital interaction can support writing development and revision (Lv et al., 2021; Teng, 2021). Thus, the two treatments maintained STAD as the common cooperative-learning framework while differing primarily in the medium through which instructional resources and learning activities were delivered. This distinction constituted the central comparative feature of the study.

Variables and Writing Assessment

The dependent variable was students' text-writing skill, operationalized as the scores obtained from writing observation report, exposition, and anecdote texts. Writing performance represented students' ability to develop relevant content, organize information according to genre-specific structures, and employ appropriate linguistic features and writing conventions. The independent variable was the instructional medium used within the STAD framework, consisting of module-based and web-based learning conditions. The operational definitions and assessment indicators are presented in Table 1.

Tabel 1. Operational Definitions and Writing Assessment Indicators

<i>Variable</i>	<i>Operational Definition</i>	<i>Indicators Observed</i>
Text-writing skill	Students' ability to produce observation report, exposition, and anecdote texts after the STAD treatment, converted into scores on a 0-100 scale.	Content development; generic structure; linguistic features; cohesion and mechanics.
Module-based STAD	STAD implementation supported by printed modules as the main learning medium.	Use of module objectives, text examples, writing steps, exercises, peer discussion, and individual writing task.
Web-based STAD	STAD implementation supported by web materials and digital interaction as the main learning medium.	Access to web materials, online examples, digital discussion, peer feedback, revision, and individual writing task.

Students' writing skills were measured through performance-based tasks, with one text produced for each genre. An analytic rubric assessed content development, generic structure, and linguistic features. Content development covered relevance, clarity, sufficiency, and elaboration of ideas; generic structure addressed the required stages of each genre; and linguistic features included diction, cohesion, sentence effectiveness, spelling, and punctuation (Helaluddin et al, 2023). The assessment was grounded in genre-based writing pedagogy, which emphasizes the relationship among communicative purpose, text organization, and linguistic realization (Martin & Rose, 2008; Tardy et al., 2020; Herman et al., 2020; Gintings, 2020), while process-genre pedagogy connects how texts are produced with what they are intended to achieve (Badger & White, 2000). This approach has also been reported to support tenth-grade students' writing development in the Indonesian senior high school context (Lukmawardani & Badriyah, 2022; Hitimala et al., 2024). Contemporary research likewise emphasizes that writing develops through the interaction of content, organization, language use, collaboration, and revision (Elabdali, 2021; Svenlin & Sørhaug, 2023).

Scoring Procedure

All writing products were scored by the researcher using the same analytic rubric and explicit performance descriptors (Li, 2022). Consistent criteria were applied across the three genres to provide a common basis for evaluating content, organization, and language. Educational assessment standards emphasize that score interpretation should be supported by appropriate criteria and consistent scoring procedures (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014). Because the texts were evaluated by a single rater, inter-rater reliability could not be estimated; this limitation was considered when interpreting the findings.

Data Analysis

Data analysis was conducted in two stages. First, descriptive statistics were calculated for the module-based and web-based STAD groups, including the mean, standard deviation, minimum, and maximum scores. Scores were examined both for overall writing performance and separately for observation report, exposition, and anecdote texts. The overall writing score was obtained from students' performance across the three writing genres. Second, inferential statistics were used to examine differences between the two instructional conditions. The Shapiro-Wilk test was used to inspect the distribution of scores, while Levene's test was used to examine variance homogeneity. Welch's independent-samples t test was used to compare the two groups because it provides a more robust comparison when variance assumptions may not be fully satisfied. The Mann-Whitney U test was additionally reported as a nonparametric robustness check where the score distribution showed departures from normality. The magnitude of between-group differences was estimated using a standardized effect size in addition to statistical significance. An alpha level of .05 was used for hypothesis testing. Because the study employed intact classes without individual random assignment, the statistical results were interpreted as evidence of differences between the two instructional conditions rather than as definitive causal effects of instructional media.

Results and Discussion

The individual raw scores were first processed into descriptive statistics so that the findings could be interpreted more directly. Table 2 presents the post-treatment writing performance of the module-based and web-based STAD groups by text genre. The table shows that both groups reached the good category, but the web-based group obtained higher mean scores across all genres.

Tabel 2. Descriptive Statistics of Students' Writing Scores by Learning Media and Text Genre

<i>Learning Media</i>	<i>Text Genre</i>	<i>Mean</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>
Module-based STAD	Observation report text	72.62	12.05	50.00	100.00
Module-based STAD	Exposition text	74.29	11.85	50.00	100.00
Module-based STAD	Anecdote text	81.27	8.42	66.67	100.00
Module-based STAD	Overall mean	76.06	6.46	61.11	85.18
Web-based STAD	Observation report text	79.53	11.67	66.67	100.00
Web-based STAD	Exposition text	77.14	10.17	58.33	100.00
Web-based STAD	Anecdote text	85.87	9.27	72.22	100.00
Web-based STAD	Overall mean	80.85	5.61	70.37	94.45

In the module-based STAD group, the overall mean was 76.06 ($SD = 6.46$). The highest mean score appeared in anecdote texts ($M = 81.27$), followed by exposition texts ($M = 74.29$) and observation report texts ($M = 72.62$). This pattern suggests that the module helped students follow the writing stages and produce acceptable text structures, especially when the genre allowed narrative and creative elements. The printed module served as procedural scaffolding because students could repeatedly consult the objectives, examples, and writing steps during group work. However, the lower scores for observation reports and exposition texts indicate that structured modules alone did not fully solve students' difficulty in developing factual details and logical arguments.

The web-based STAD group achieved a higher overall mean of 80.85 ($SD = 5.61$). This group also obtained higher scores in all three text genres: observation report texts ($M = 79.53$), exposition texts ($M = 77.14$), and anecdote texts ($M = 85.87$). The largest descriptive advantage appeared in observation report texts. This result is pedagogically reasonable because web-based learning can provide richer reference materials, examples, and visual information that help students describe objects or phenomena more concretely. The web environment also allowed students to exchange ideas and revise drafts more flexibly, which supported the development of content and cohesion.

The findings may be explained by the wider access to online learning resources available to students in the web-based STAD group. During the implementation of web-based STAD, students accessed multiple online sources to compare factual information before composing their observation reports. This process encouraged them to expand and verify ideas rather than relying solely on the examples provided by the teacher. In contrast, students in the module-based class tended to depend on the information presented in the printed module, resulting in less varied content development. These classroom learning patterns help explain why the web-based group achieved better performance, particularly in the content development component can be seen in Figure 1.

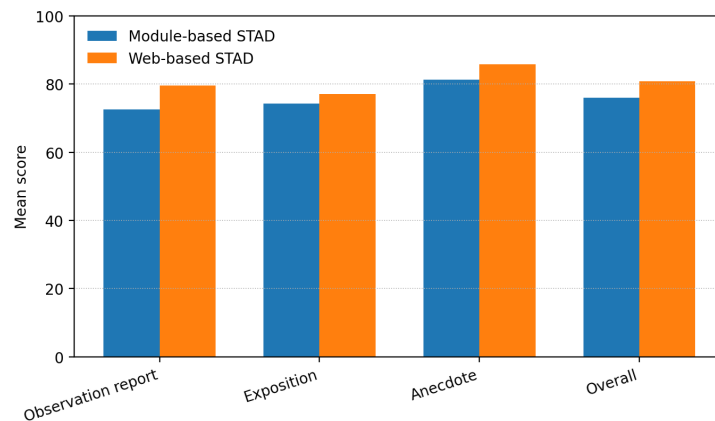


Fig. 1. Mean Writing Scores in Module-Based and Web-Based STAD Groups

To determine whether the descriptive differences were statistically meaningful, the group means were compared using inferential statistics. Table 3 shows that the web-based group outperformed the module-based group on the overall writing score. The overall difference was 4.79 points, and the effect size was medium to large ($d = 0.79$). The Mann-Whitney U test also confirmed the robustness of the overall difference, $U = 849.00$, $p = .006$.

Table 3. Inferential Comparison Between Web-Based and Module-Based STAD

<i>Comparison</i>	<i>Mean Difference</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Cohen's d</i>
Observation report text	+6.91	2.43	68	.018	0.58
Exposition text	+2.86	1.08	68	.283	0.26
Anecdote text	+4.60	2.17	68	.033	0.52
Overall mean	+4.79	3.31	66.69	.001	0.79

These results provide a direct answer to the research questions. Regarding RQ1, students taught through web-based STAD demonstrated significantly higher overall writing performance than those taught through module-based STAD. The difference of 4.79 points, accompanied by a medium-to-large effect size ($d = 0.79$), suggests that the instructional medium may play a meaningful role even when the same cooperative learning model is employed. However, the findings for RQ2 show that this advantage was not uniform across text genres. Significant differences were found for observation report and anecdote texts, whereas the difference in exposition writing was not statistically significant. Thus, the effect of instructional media within STAD appears to be genre-sensitive rather than universal.

The genre-based comparison offers a more nuanced interpretation. Web-based STAD showed significant advantages in observation report texts and anecdote texts. In observation reports, digital access may have helped students gather concrete information and organize descriptions based on richer examples. In anecdote texts, online discussion and peer feedback may have encouraged students to develop more engaging situations, reactions, and language choices. These results are consistent with evidence that technology-supported collaborative writing can provide expanded opportunities for interaction, feedback, and revision (Teng, 2021; Zhang et al., 2021; Liu et al., 2024; Pardede, 2024). Meta-analytic evidence further indicates that online and peer feedback can positively contribute to writing development, although the magnitude of the effect may vary across instructional and genre conditions (Lv et al., 2021; Vuogan & Li, 2023; Lu et al., 2023).

The better performance of students in the web-based STAD group may be associated with their access to a wider range of online anecdotal texts. Exposure to diverse examples may have enriched students' understanding of humorous situations, social criticism, and the generic structure of anecdotal writing, thereby supporting the development of more varied narrative ideas. However, because students' actual patterns of online resource use were not directly measured, this explanation should be regarded as a plausible pedagogical interpretation rather than an observed mechanism.

The difference in exposition texts was positive but not statistically significant. This finding is important because it prevents an overgeneralized claim that web-based STAD automatically improves every writing genre. Exposition writing requires students to formulate a thesis, develop arguments, connect reasons with evidence, and close with a clear reaffirmation. Digital resources may facilitate access to information, but they do not automatically strengthen argument quality. Therefore, exposition writing may require explicit scaffolding for claim–evidence–reasoning, logical connectors, source evaluation, and guided revision (Li &

Mak, 2022). Recent research indicates that argumentative writing benefits from explicit instruction and genre-specific cognitive scaffolding, particularly when students must coordinate claims, evidence, and reasoning (Landrieu et al., 2023; Ouyang et al., 2025). Combining explicit writing procedures with genre-specific models may therefore be particularly useful for strengthening exposition writing (Badger & White, 2000; Landrieu et al., 2023; Kindenberg, 2021).

Although the between-group difference in exposition writing was not statistically significant, the result suggests that changing the instructional medium alone may be insufficient to produce substantial differences in argumentative writing. Developing exposition texts requires sustained support for logical reasoning, evidence use, text organization, and revision (Zhang & Chen, 2022).

Taken together, the genre-specific findings indicate that the effectiveness of instructional media should be understood in relation to the demands of the writing task. Web-based resources appear to provide greater advantages when students need access to varied information, examples, and opportunities for idea elaboration, as reflected in the observation report and anecdote tasks. In contrast, exposition writing requires more than access to information. Students must evaluate evidence, construct logical relationships among claims, and organize arguments coherently. These higher-level reasoning demands may help explain why web-based resources did not produce a statistically significant advantage over the structured module for exposition writing. Therefore, the contribution of digital media to writing instruction may depend on the degree of alignment between its affordances and the cognitive, informational, and rhetorical demands of a particular genre.

These findings extend previous studies on STAD and cooperative learning. Previous research has reported positive effects of STAD and cooperative-learning strategies on student achievement, writing performance, participation, and group responsibility (Yusuf et al., 2019; Resmi et al., 2020; Karnedi, 2025; Mantra et al., 2025; Tafonao et al., 2025). The present findings extend this literature by showing that the instructional environment also matters when the cooperative-learning structure is held constant. When STAD is supported by printed modules, students may benefit from structured sequencing, clarity, and step-by-step guidance, whereas web-based STAD may offer wider access to examples, more flexible interaction, and additional opportunities for revision. Thus, the instructional medium appears to shape how cooperative-learning activities are enacted in writing instruction.

Importantly, the present findings should not be interpreted as evidence that STAD itself caused the observed differences, because STAD was implemented in both groups. Instead, the findings suggest that the instructional medium through which STAD was supported was associated with different opportunities for students to access information, exchange ideas, and revise their writing. This distinction strengthens the contribution of the study: the effectiveness of a cooperative-learning model may depend partly on the instructional environment in which its collaborative processes take place. Accordingly, decisions about cooperative learning should consider not only the learning model but also the type of media and the nature of the writing task. This interpretation is also consistent with research indicating that collaborative writing can support idea negotiation, peer interaction, and writing development (Elabdali, 2021; Svenlin & Sørhaug, 2023; Hakim, 2023).

The findings also suggest that the effectiveness of web-based STAD cannot be attributed solely to the availability of digital resources; the cooperative-learning structure may also have provided opportunities for discussion and peer interaction before individual writing. However, because these interaction processes were not directly measured, they should be interpreted cautiously as possible mechanisms rather than established findings. The findings remain relevant to current Indonesian language learning under Kurikulum Merdeka, which emphasizes logical, critical, and creative writing across print and digital media (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, 2024). From this perspective, module-based and web-based STAD need not be treated as mutually exclusive alternatives. Printed modules may provide structured procedural guidance, whereas web-based environments can extend access to resources, interaction, and feedback. A balanced instructional design may therefore combine the procedural strengths of modules with the informational and interactive affordances of web-based learning.

This study has several limitations. First, the data came from one school and two intact classes, so the findings should be generalized with caution. Second, the analysis focused on only three text genres taught in the research setting. Third, the data were collected during the Curriculum 2013 period (Nisja, 2018), although the interpretation was updated in relation to current Indonesian language-learning requirements. In addition, all writing products were assessed by a single rater using an analytic scoring rubric. Although the rubric was applied consistently, the absence of inter-rater reliability testing may have limited scoring consistency. The study also did not directly examine students' online interactions, resource use, peer-feedback exchanges, or revision behaviour; therefore, the mechanisms proposed to explain the differences between the two instructional conditions remain interpretive. Future research should involve multiple raters, report inter-rater reliability, replicate the comparison under the current curriculum, include larger

and more diverse samples, examine additional text genres, and collect process data on students' use of digital resources, peer interaction, and feedback during writing.

Conclusion

This study compared students' text-writing skills in module-based and web-based STAD implementation. The findings show that both media supported cooperative writing instruction, but the web-based STAD group achieved higher overall writing performance. The web-based group reached an overall mean of 80.85, while the module-based group reached 76.06. The difference was statistically significant and showed a medium to large effect size. The comparison across genres indicates that web-based STAD was especially beneficial for observation report and anecdote texts. The advantage was smaller and not significant for exposition texts, which suggests that argumentative writing needs more explicit scaffolding than digital access alone can provide. These findings demonstrate that the effectiveness of STAD depends not only on group work but also on the instructional media that shape access, interaction, feedback, and revision. The study contributes to cooperative learning research by making the novelty explicit: it isolates the role of instructional media within the same STAD model in genre-based Indonesian language writing instruction. For classroom practice, teachers can use web-based STAD to strengthen collaborative idea development and revision, while maintaining module-like scaffolding for text structure and language features. Future studies should test this design under Kurikulum Merdeka with broader samples and more detailed process data.

Declarations

- Author contribution** : All authors contributed equally to the research and manuscript preparation.
- Funding statement** : This research did not receive any funding.
- Conflict of interest** : Both authors declare that they have no competing interests.
- Ethics Approval** : The study was conducted as part of regular classroom learning. Permission and consent procedures should be reported according to the journal ethics requirements.
- Additional information** : No additional information is available for this paper.

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