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Developing a Collaborative Virtual Workspace-Based Visual Learning Environment to Enhance University Students' Collaboration Skills in a Multimedia Development Course

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A B S T R A C T

This study developed and evaluated a Collaborative Virtual Workspace-based visual learning environment using Canva Whiteboard for a Multimedia Development course. The study employed design and development research guided by the Analysis, Design, Development, Implementation, and Evaluation model. Participants were 56 sixth-semester Educational Technology students, aged 20 to 22 years, who were selected through total sampling at Universitas Palangka Raya, Indonesia. Small-group practicality reached 85%, field practicality reached 91%, and learning implementation reached 91%. Students' mean collaboration score increased from 62.64 (SD = 4.42) to 86.88 (SD = 4.47). A paired-samples t-test indicated a significant increase, $t(55) = 41.99$, $p < .001$, with a normalized gain of 0.649. The findings indicate that a deliberately structured Canva Whiteboard environment can support collaborative multimedia-development activities.

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INTRODUCTION

Collaboration has become a central learning outcome in higher education because academic and professional tasks increasingly require individuals to coordinate responsibilities, exchange ideas, negotiate decisions, and produce shared outcomes. This competence is especially important for Educational Technology students, who must integrate instructional, visual, and technical considerations when developing multimedia learning products. A multimedia project rarely depends on one individual skill. Students need to analyze learner needs, define objectives, organize content, create visual representations, design navigation, develop prototypes, and evaluate the resulting product through coordinated group work.

Group work, however, does not automatically generate balanced participation or productive interaction. Online and blended projects frequently face unequal participation, unclear responsibilities, limited preparation, interpersonal tension, and weak coordination (Donelan & Kear, 2024). Students may complete a project successfully while only a small number of members perform most of the substantive work. This free-rider pattern weakens individual accountability and makes it difficult for lecturers to determine how each member contributed to the final product.

The quality of digital collaboration also depends on more than access to communication technology. Bach and Thiel (2024) describe productive collaborative interaction in terms of cognitive activity, work-process organization, participation, task-related communication, and group climate. Instant messaging applications can support rapid communication, but their linear conversation structure provides limited assistance for visually organizing complex ideas, comparing design alternatives, recording revisions, and displaying the relationship between project components. These limitations are particularly relevant in multimedia-development courses, where students must coordinate aesthetic and technical decisions at the same time.

A preliminary study in the Educational Technology Study Program at Universitas Palangka Raya identified similar problems. More than 78% of students from the previous cohort demonstrated collaboration skills within the moderate category. The initial questionnaire examined individual responsibility, social interaction, active contribution, and respect for different opinions. An interview with the course lecturer showed that students remained hesitant to provide constructive feedback, and the lecturer found it difficult to monitor individual participation in conventional group assignments. Document analysis also showed that previous tasks emphasized the final product but did not systematically record how students generated ideas, divided responsibilities, resolved disagreement, and revised their work.

These findings indicated a need for a learning environment that could support visual organization, synchronous and asynchronous interaction, visible participation, and structured project progression. A Collaborative Virtual Workspace can address these needs by providing a shared digital space in which students externalize ideas, arrange information spatially, provide feedback, revise common products, and continue their work across different times and locations. Canva Whiteboard offers an expandable shared canvas with comments, sticky notes, reactions, templates, and real-time collaboration features. The pedagogical value of these functions, however, depends on how lecturers organize them within a coherent instructional design.

The present study responds to this gap by transforming Canva Whiteboard from a general-purpose digital canvas into a structured visual learning environment for collaborative multimedia development. The product integrates needs analysis, concept mapping, storyboarding, asset organization, prototype development, peer review, revision, presentation, and reflection within a six-meeting learning sequence. Its novelty lies not in the use of Canva Whiteboard alone, but in the deliberate integration of visual scaffolding, shared responsibility, visible participation, synchronous and asynchronous collaboration, and iterative product development. The study evaluates the product using the criteria of validity, practicality, implementation fidelity, and preliminary effectiveness, drawing on Nieveen's (1999) product-quality framework.

This study addressed three research questions: (1) How was the Collaborative Virtual Workspace-based visual learning environment developed for the Multimedia Development course? (2) To what extent did the developed environment meet the criteria of content validity, design validity, practicality, and implementation fidelity? (3) Was there a significant improvement in students' collaboration skills after participating in the Canva Whiteboard-based learning activities?

THEORETICAL REVIEW

Collaborative Learning in Digital Environments

Collaboration in higher education involves more than dividing tasks among group members. It requires learners to coordinate responsibilities, exchange information, negotiate different perspectives, provide constructive feedback, and maintain shared responsibility for a common outcome. These processes are particularly important in multimedia development because students must integrate instructional, visual, and technical decisions into one coherent learning product.

Digital environments can extend collaborative activity beyond scheduled classroom meetings, but access to a platform does not automatically produce balanced participation or productive interaction. Online group projects may still involve unequal contribution, unclear expectations, limited preparation, and interpersonal tension (Donelan & Kear, 2024). Accordingly, digital collaboration requires a learning design that makes responsibilities visible, organizes interaction, and connects individual contributions with the shared product.

Computer-Supported Collaborative Learning and Collaborative Virtual Workspaces

Computer-supported collaborative learning explains how digital technologies mediate interaction, knowledge construction, and the production of shared outcomes. From this perspective, technology should not function merely as a communication channel. It should help students articulate ideas, respond to peers, compare alternatives, organize evidence, and revise a common product (Dillenbourg, 1999).

A Collaborative Virtual Workspace provides a shared digital space in which learners externalize ideas, arrange information spatially, document decisions, and continue collective work across different times and locations. Bach and Thiel (2024) show that the quality of digital collaboration is associated with cognitive activity, participation, task-related communication, work-process organization, and group climate. These dimensions indicate that the effectiveness of a virtual workspace depends on the pedagogical organization of its features rather than on platform availability alone.

Social Interdependence and Individual Accountability

Social interdependence theory emphasizes that effective group work requires both positive interdependence and individual accountability (Johnson & Johnson, 2009). Positive interdependence exists when group members recognize that successful completion of the shared task depends on each member's contribution. Individual accountability ensures that each student remains responsible for identifiable work rather than relying on a small number of group members.

In the developed workspace, positive interdependence was established through shared multimedia-development goals, sequenced outputs, and group deadlines. Individual accountability was supported through task assignments, comments, sticky notes, visible design elements, peer feedback, and revision records. These features were intended to make the collaborative process more observable to both students and lecturers.

Visual Scaffolding for Multimedia Development

Visual scaffolding uses structured representations and prompts to help learners understand complex processes, organize information, and monitor task completion. This support is relevant to multimedia-development courses because students must translate abstract instructional decisions into concrete representations, including concept maps, navigation structures, storyboards, asset collections, and prototypes.

The developed environment incorporated numbered zones, directional arrows, templates, diagrams, examples, prompts, and a visual asset area. These elements were designed to reduce procedural uncertainty, show the current project stage, reveal incomplete components, and guide subsequent action. The visual structure therefore supported both multimedia production and the regulation of collaborative work.

Synthesis of Previous Studies and Research Gap

Existing studies converge on the conclusion that productive digital collaboration requires more than access to communication technology. Online group projects continue to face unequal participation, unclear responsibilities, and relational difficulties (Donelan & Kear, 2024), while high-quality digital interaction depends on organized work processes, sustained participation, task-related communication, and a constructive group climate (Bach & Thiel, 2024). Research on socially shared regulation further indicates that structured scaffolding can promote more balanced contribution and a more positive teamwork environment in online project-based learning (Cortázar et al., 2022). Visual thinking and cooperative learning have also been associated with interaction, positive interdependence, group reflection, and social competencies (Maldonado López et al., 2023).

Taken together, these findings show that collaborative platforms become educationally meaningful when their technological affordances are aligned with explicit learning sequences, regulation supports, visual representations, and feedback processes. Nevertheless, previous studies have generally examined online group projects, shared regulation, visual thinking, or collaborative platforms as separate issues. Limited evidence is available on the systematic development of a visually scaffolded Canva Whiteboard environment specifically for a university Multimedia Development course. This study addresses that gap by integrating shared visual production, visible responsibility, synchronous and asynchronous interaction, peer feedback, revision, and reflection within one structured learning environment.

METHODOLOGY

Research Design

This study employed design and development research to develop and evaluate a Canva Whiteboard-based Collaborative Virtual Workspace for a Multimedia Development course. The development process followed the ADDIE model, which includes Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009).

The study evaluated product quality through validity, practicality, and effectiveness, following Nieveen's (1999) framework. Expert judgment established content and design validity. Small-group and field responses provided practicality evidence. Observation examined implementation fidelity, while a one-group pretest-posttest design provided preliminary evidence of effectiveness.

The effectiveness design can be expressed as O1 X O2, where O1 represents the collaboration-skills pretest, X represents the six-meeting Canva Whiteboard intervention, and O2 represents the posttest. Because the study did not include a comparison group, the findings indicate change after the intervention but do not establish a definitive causal effect.

Research Setting and Participants

The study was conducted from February to March 2026 in the Educational Technology Study Program at Universitas Palangka Raya, Indonesia. The participants were 56 sixth-semester students enrolled in a three-credit Multimedia Development course. Their ages ranged from 20 to 22 years.

The study used total sampling because all 56 students registered in the course participated in the main implementation. Before the intervention, the students had used Canva for individual design activities, but they had not used

Canva Whiteboard as a structured environment for group collaboration. All participants completed both the pretest and posttest, and no participant was excluded from the final analysis.

The course lecturer and the researcher organized the 56 students into nine collaborative groups, with approximately six students in each group. Some groups contained seven members because the participants could not be distributed equally. The intervention consisted of six meetings, each lasting 150 minutes, for a total scheduled duration of 900 minutes. The design combined synchronous collaboration during class meetings with asynchronous group tasks outside class.

Product Description

The developed product was a structured visual learning environment created within Canva Whiteboard. The study did not develop a new software application. Instead, it designed a pedagogical workspace that organized Canva Whiteboard features into a sequential learning environment for collaborative multimedia development.

The workspace contained an orientation area, a learning-needs analysis zone, a concept-mapping zone, a storyboard and navigation-flow zone, a visual-asset gallery, a prototype-development zone, a peer-feedback area, a product-exhibition area, and a collaboration-reflection area. Templates, prompts, diagrams, numbered zones, directional arrows, output examples, sticky notes, comments, and reaction features functioned as visual and procedural scaffolds.

The environment connected group activities across the complete development cycle. Students analyzed learning needs, selected a topic, designed a navigation structure, prepared a storyboard, organized visual assets, developed a prototype, reviewed other groups' work, revised the product, and presented the final media. The shared canvas enabled each group to maintain one evolving project space throughout the intervention.

Development Procedures

Analysis

The analysis stage identified collaboration problems, learner characteristics, course requirements, and technological needs. A preliminary 18-item collaboration questionnaire using a five-point Likert scale was administered to all 68 students from the previous cohort. A 15-minute semi-structured interview was conducted face-to-face with the course lecturer. The interview was recorded and transcribed for qualitative needs analysis. The researchers also examined previous group-assignment documents, including mind maps, storyboards, mock-ups or prototypes, and final instructional-media products.

The raw preliminary-questionnaire scores ranged from 18 to 90 and were interpreted using three equal-width categories: low (18-41), moderate (42-65), and high (66-90). More than 78% of the 68 respondents were within the moderate category. The findings also indicated unequal task distribution, limited active participation, difficulty resolving disagreement, and insufficient shared responsibility. The lecturer reported difficulty tracing individual contributions and noted that students were reluctant to provide constructive peer feedback.

Document analysis showed that previous digital activities emphasized final products and did not systematically support or record the collaborative process.

Design

The design stage produced the workspace concept, storyboard, visual layout, learning sequence, collaborative tasks, and assessment instruments. The researchers aligned each activity zone with the stages of multimedia development and the targeted collaboration dimensions.

The design incorporated shared goals, visible responsibilities, visual scaffolding, synchronous and asynchronous interaction, iterative development, peer feedback, revision, and reflection. Each meeting generated an output that became an input for the next stage, ensuring continuity across the project.

Development

During development, the researchers created the Canva Whiteboard templates, activity zones, visual instructions, diagrams, prompts, asset areas, and reflection sections. One expert in learning-media development from an Educational Technology program evaluated the content, while one Educational Technology expert with expertise in instructional and visual design evaluated the design. The content-validation and design-validation instruments each contained 12 items, used a five-point Likert scale, and provided space for qualitative comments. The two experts completed their evaluations separately according to their respective areas of expertise.

The content expert recommended simplifying the explanation of instructional-design procedures in the storyboard area. The researchers shortened the text and added a brief glossary. The design expert recommended improving contrast and increasing the distance between group zones. The researchers used a lighter pastel background and expanded the workspace to reduce visual congestion and cursor overlap.

Small-Group Trial

A small-group trial involved nine Educational Technology students selected through purposive sampling from the same cohort that later participated in the main implementation. The group consisted of three students with high academic achievement, three with moderate achievement, and three with lower achievement. The trial was conducted during the development stage before the six-meeting implementation and examined navigation, readability, collaborative-feature functionality, technical accessibility, and the clarity of the user guide.

The students accessed the template, added sticky notes, moved visual elements, commented on shared work, and reviewed the user instructions. Immediately after the trial, they completed a 10-item practicality questionnaire using a five-point Likert scale and provided open-ended feedback in the qualitative-comment section. The trial identified difficulty locating the starting point, overlapping text when several users edited one sticky note, and locked visual elements. The researchers enlarged the sequence numbers and navigation arrows, added editing rules, unlocked relevant elements, and provided a visual asset bank.

Implementation

The revised workspace was implemented during six meetings. Table 1 summarizes the instructional sequence, collaborative activities, and expected outputs.

Table 1. Six-meeting implementation of the Canva Whiteboard-based Collaborative Virtual Workspace

Meeting	Course focus and synchronous collaboration	Asynchronous task and expected output
1	Introduction to instructional media, media classification, and visual elements. Students explored the Canva Whiteboard interface through names, sticky notes, reactions, and shared movement of visual elements.	Groups developed a mind map about examples of instructional media used in schools and related problems.
2	Learner and context analysis. Groups completed a prepared Needs Analysis Zone and identified target learners, subject matter, learning barriers, and use context.	Groups finalized the needs analysis and selected the school subject matter for their media project.
3	Instructional design, media-content outlines, navigation flow, and storyboarding. Students developed flowcharts and frame-by-frame content in the Storyboard Zone.	Groups completed a storyboard containing planned text, visual assets, and interactive components.
4	Color, typography, layout, and copyright. Students organized images, icons, text, and color schemes in the Visual Asset Gallery and divided design responsibilities.	Groups produced an initial mock-up or prototype based on the storyboard.
5	Formative evaluation. Students conducted a digital gallery walk and provided comments, suggestions, reactions, and feedback on another group's prototype.	Groups revised their product using peer and lecturer feedback.
6	Product dissemination and teamwork reflection. Groups presented the final instructional-media product. The lecturer and researcher evaluated the process and outcome.	Students completed the collaboration posttest, individual reflection, and anonymous peer-assessment activity.

Evaluation

Evaluation occurred throughout development. Formative evaluation included expert review, small-group testing, product revision, observation, and peer feedback. Summative evaluation examined final validity, practicality, implementation fidelity, and changes in collaboration skills.

Data Analysis

Expert-validation, practicality, and implementation data were analyzed using percentage scores. Each percentage was calculated as the obtained score divided by the maximum possible score and multiplied by 100. The collaboration questionnaire produced raw scores from 18 to 90. For statistical reporting, each raw score was converted to a 0-100 scale by dividing the obtained raw score by 90 and multiplying the result by 100.

Pretest and posttest data were summarized using the mean, standard deviation, median, minimum, and maximum. The Shapiro-Wilk test examined the normality of the paired difference scores. Because the difference scores were normally distributed, a paired-samples t-test examined the pretest-posttest difference at a significance level of .05. Cronbach's alpha was calculated from the 56 pretest responses to assess the internal consistency of the 18-item collaboration instrument.

The normalized gain was calculated as $g = (\text{posttest} - \text{pretest}) / (\text{maximum score} - \text{pretest})$. Values below .30 were categorized as low, values from .30 to below .70 as moderate, and values of .70 or above as high (Hake, 1998). Cohen's dz was calculated as the mean paired difference divided by the standard deviation of the paired differences. The effect-size result was interpreted cautiously because the study did not include a comparison group.

RESULTS

Needs-Analysis Findings

The needs analysis identified three central problems. First, group work involved unequal contribution, and a small number of students often completed most of the work. Second, students experienced difficulty negotiating aesthetic and technical differences. Third, the lecturer could not consistently monitor individual participation because previous assignments emphasized final products rather than the development process.

The preliminary questionnaire completed by 68 students showed that more than 78% of respondents obtained raw scores within the moderate collaboration category of 42-65. The lecturer interview indicated that students were hesitant to provide constructive feedback. Document analysis of mind maps, storyboards, mock-ups or prototypes, and final media products further showed that conventional digital communication did not systematically facilitate responsibility distribution, visual organization of ideas, or documentation of revisions. These findings informed the development of the structured Canva Whiteboard environment.

Product Design and Development

The final product organized multimedia-development activities into connected visual zones. Each zone contained a concise instruction, visual prompt, collaborative task, and expected output. The product enabled students to move from problem analysis to final presentation without leaving the shared workspace.

The design revisions improved navigation, readability, and technical accessibility. Large numbered markers and directional arrows clarified the sequence. Editing rules reduced overlapping input, and the visual asset bank supported prototype development. Lighter backgrounds and wider spacing improved contrast and reduced cursor congestion.

Product Validity

Table 3. Expert-validation results

Validation area	Percentage	Interpretation
Content validity	90%	Highly valid
Design validity	94%	Highly valid

The content expert assigned a score of 90%, indicating that the learning content, sequence, and multimedia-development activities were appropriate. The design expert assigned a score of 94%, indicating that the visual organization, navigation, instructional structure, and collaborative features met the expected design criteria. The researchers revised the product using both experts' qualitative recommendations before implementation.

Small-Group Practicality

Table 4. Small-group practicality results

Practicality aspect	Percentage	Interpretation
Navigation and access	86.67%	Highly practical
Visual readability and instructional clarity	82.22%	Highly practical
Collaborative-feature functionality	91.11%	Highly practical
Usefulness of the user guide	80.00%	Practical
Overall practicality	85.00%	Highly practical

The small-group trial produced an overall practicality score of 85%. Collaborative-feature functionality received the highest score, whereas the user guide received the lowest score. Students' comments guided revisions to navigation, editing procedures, and access to visual assets.

Field Practicality and Implementation Fidelity

Table 5. Practicality and implementation results

Evaluation component	Percentage	Interpretation
Small-group practicality	85%	Highly practical
Field practicality	91%	Highly practical
Implementation fidelity	91%	Highly implemented

Field practicality reached 91% after the formative revisions. Students were able to access the workspace, follow the visual sequence, use the collaborative functions, and complete their project tasks with limited technical difficulty. The lecturer could monitor group progress, comments, and revisions within the shared canvas.

The two observers reported a final implementation percentage of 91%. Most planned activities were completed as intended, including orientation, needs analysis, storyboarding, asset production, prototyping, peer review, revision, presentation, and reflection. Some groups required additional time during storyboard and prototype development, but this variation did not alter the overall instructional sequence.

Improvement in Collaboration Skills

Table 6. Descriptive statistics for pretest and posttest collaboration scores

Measurement	N	Mean	SD	Median	Minimum	Maximum
Pretest	56	62.64	4.42	62.00	55	73
Posttest	56	86.88	4.47	87.00	78	96

The mean collaboration score increased by 24.23 points, from 62.64 before the intervention to 86.88 after the intervention. All 56 participants obtained a higher posttest score than pretest score.

The Shapiro-Wilk test indicated that the paired difference scores did not significantly depart from normality, $W = .970$, $p = .181$. Therefore, the paired-samples t-test was used as the primary inferential analysis.

Table 7. Paired-samples t-test and normalized gain results

Analysis	Result	Interpretation
Mean paired difference	24.23	Positive increase
95% confidence interval	23.08 to 25.39	Interval excludes zero
Paired-samples t-test	$t(55) = 41.99$, $p < .001$	Significant difference
Normalized gain	0.649	Moderate improvement

Analysis	Result	Interpretation
Cohen's dz	5.61	Very large standardized difference

The paired-samples t-test showed a statistically significant pretest-posttest difference, $t(55) = 41.99$, $p < .001$. The normalized gain of 0.649 indicated moderate improvement and approached the threshold for the high category. Cohen's dz was 5.61. This unusually large standardized difference should be interpreted cautiously because the design used one group and relied primarily on self-assessment.

Summary of Product Quality

Table 8. Summary of product-quality evidence

Criterion	Result	Conclusion
Content validity	90%	Highly valid
Design validity	94%	Highly valid
Small-group practicality	85%	Highly practical
Field practicality	91%	Highly practical
Implementation fidelity	91%	Highly implemented
Normalized gain	0.649	Moderate improvement
Paired-samples t-test	$p < .001$	Significant increase

Taken together, the evidence indicates that the Canva Whiteboard-based Collaborative Virtual Workspace was valid, practical, consistently implemented, and associated with improved collaboration scores.

DISCUSSION

This study produced four principal findings. First, the Collaborative Virtual Workspace achieved high content and design validity, with scores of 90% and 94%, respectively. Second, formative revision increased practicality from 85% in the small-group trial to 91% during field implementation. Third, the six-meeting learning sequence achieved 91% implementation fidelity. Fourth, students' mean collaboration score increased from 62.64 to 86.88, with a normalized gain of 0.649 and a statistically significant paired difference. Taken together, these findings indicate that the workspace was valid, practical, implementable, and associated with meaningful improvement in students' self-reported collaboration skills.

Validity and Pedagogical Organization

The validation results indicate that the product achieved strong alignment between course content, visual design, and collaborative activity. The high content score suggests that the learning sequence reflected the core stages of multimedia development. The design score shows that the workspace provided an understandable structure for navigating complex tasks.

These findings emphasize that the educational value of Canva Whiteboard does not arise solely from its technical features. The platform became pedagogically meaningful because the researchers organized comments, sticky notes, templates, visual zones, and shared editing around explicit learning goals. This distinction is important. A general-purpose digital canvas may facilitate communication, but a structured learning environment guides how students analyze problems, organize knowledge, coordinate responsibilities, and evaluate products.

The design addresses several challenges reported in the literature. Donelan and Kear (2024) identify unequal participation, inadequate preparation, unclear expectations, and problematic relationships as persistent issues in online group projects. The present workspace responded through sequenced instructions, visible outputs, shared project goals, and formal peer feedback. These elements reduced ambiguity and made the group process more observable.

Practicality and Implementation

The improvement from 85% practicality in the small-group trial to 91% in the field implementation shows the importance of formative evaluation. Students' difficulties were concrete rather than abstract. They needed clearer starting points, larger navigation markers, explicit simultaneous-editing rules, and access to modifiable assets. Addressing these issues improved the usability of the final environment.

Usability has direct implications for collaborative learning. When students spend excessive cognitive effort locating instructions or resolving avoidable technical problems, they have less capacity for discussion, negotiation, and design. The numbered zones, arrows, concise prompts, and examples reduced procedural uncertainty and allowed students to focus on project decisions.

The 91% implementation score indicates that the learning sequence was feasible in an authentic university course. The combination of synchronous and asynchronous work was particularly relevant. Students could begin a task during class, continue it outside scheduled hours, and return to the same visual workspace without exchanging multiple document versions. Bach and Thiel (2024) emphasize that high-quality digital collaboration requires organized work processes, sustained participation, task-related communication, and a constructive group climate. The present intervention incorporated these dimensions through structured task zones, visible progress, comments, feedback, and shared revision.

The results also correspond with research in design-oriented education. Adriyanto et al. (2025) describe collaborative platforms as designed interaction environments that shape communication, co-creation, and the representation of ideas. The Canva Whiteboard environment in this study similarly guided students from initial analysis to prototype development and collective evaluation.

Collaboration-Skills Improvement

The significant increase in collaboration scores suggests that the intervention supported the behaviors targeted by the 18-item instrument. Active contribution was embedded in needs analysis, storyboarding, asset production, and prototype development. Interactive communication occurred through comments, sticky-note responses, and discussion. Conflict management and negotiation were required when students selected content, visual styles, and design alternatives. Shared responsibility was reinforced through staged outputs and deadlines, while mutual respect was practiced through peer review and reflection.

The result can be interpreted through social constructivism. Students constructed knowledge by explaining ideas, manipulating shared representations, responding to peers, and revising a collective product. The canvas made thinking visible, which allowed ideas to become objects for discussion and refinement. This process differs from a passive use of visual media because students actively produced and reorganized the visual environment.

The findings also support the relevance of socially shared regulation. Cortázar et al. (2022) found that scaffolding shared regulation in online project-based learning can produce more balanced contributions and a more positive teamwork environment. In the present study, visual zones, output requirements, and sequenced activities helped groups plan, monitor, and revise their work. The synchronous classroom activities and asynchronous follow-up tasks remained connected within one shared space.

Visual thinking may have further supported group coordination. Maldonado López et al. (2023) found that visual thinking and cooperative learning were associated with interaction, positive interdependence, reflection, and group competencies. Concept maps, flowcharts, storyboards, asset galleries, and prototypes enabled students to examine relationships among ideas and negotiate concrete design decisions.

The peer-feedback session provided a further mechanism for collaboration development. Students had to evaluate another group's product, communicate criticism respectfully, explain design decisions, and revise their own work. Feedback therefore functioned as both an evaluation process and a collaboration exercise.

The visibility of digital contributions may have strengthened individual accountability. Comments, visual elements, and revisions offered more process evidence than a conventional final-product assessment. However, digital activity should not be treated as a perfectly objective measure of contribution. A high frequency of edits does not necessarily indicate high-quality participation. Digital traces are most useful when combined with self-assessment, peer assessment, observation, and product evidence.

Interpretation of the Large Effect Size

The paired difference produced a very large Cohen's dz. This result reflects a large mean increase combined with relatively consistent change across participants. Nevertheless, several features of the design may have inflated the standardized difference. The same collaboration construct was measured twice, students knew the expected collaborative behaviors after completing the project, and the posttest followed an intensive group experience. Self-assessment may also be influenced by social desirability and positive reactions to a new learning environment.

Most participants had not previously used Canva Whiteboard for structured group collaboration. However, nine participants had received limited prior exposure during the small-group trial because they were drawn from the same cohort as the main implementation. Platform novelty and differential familiarity may therefore have contributed to engagement and posttest responses. The study should describe the improvement as preliminary evidence associated with the intervention rather than definitive proof that Canva Whiteboard alone caused the change.

Theoretical and Practical Contributions

The study contributes by linking platform affordances with an explicit instructional design. It operationalizes social constructivist principles through shared visual production, applies computer-supported collaborative learning through integrated communication and co-creation, and combines positive interdependence with visible individual responsibility.

The intervention also extends visual scaffolding from individual task support to group regulation. The visual sequence helped students identify the project stage, recognize incomplete work, coordinate the next action, and connect individual tasks with the group objective.

For practice, the findings suggest that lecturers should not introduce a digital whiteboard as an unstructured blank canvas. They should define the activity sequence, establish editing protocols, provide clear visual navigation, specify outputs, and integrate peer feedback. Collaboration assessment should also draw on several forms of evidence rather than self-report alone.

CONCLUSIONS AND RECOMMENDATIONS

This study developed a Canva Whiteboard-based Collaborative Virtual Workspace for a Multimedia Development course using the ADDIE model. The product integrated visual scaffolding, shared project spaces, synchronous and asynchronous interaction, peer feedback, revision, and reflection within a six-meeting instructional sequence.

The product achieved content and design validity scores of 90% and 94%. Practicality increased from 85% in the small-group trial to 91% in the field implementation, and implementation fidelity reached 91%. Students' mean collaboration score increased from 62.64 to 86.88, with a normalized gain of 0.649 and a statistically significant paired difference.

The findings indicate that a collaborative whiteboard can support multimedia-development teamwork when instructors organize its features through deliberate pedagogical design. The contribution of the study lies in transforming an existing digital canvas into a structured learning environment for shared analysis, design, production, feedback, and reflection. Because the study did not include a comparison group and relied substantially on self-assessment, the results should be treated as preliminary evidence that requires confirmation through stronger experimental and mixed-methods designs.

FURTHER STUDY

1. The one-group pretest-posttest design did not control for testing effects, maturation, lecturer support, or other influences that may have contributed to the increase.
2. The participants came from one Educational Technology program at one Indonesian university, which limits generalization to other disciplines and contexts.
3. The primary effectiveness measure relied on student self-assessment. Future studies should integrate peer ratings, observer scores, interaction logs, revision histories, and product-quality measures.
4. The content and design evaluations involved one expert in each domain. Future research should include several validators and report content-validity and inter-rater indices.
5. The study did not compare Canva Whiteboard with conventional group work, instant messaging, learning management systems, or other digital whiteboards. Controlled or quasi-experimental research is needed.
6. Future studies should analyze each collaboration dimension separately and use learning analytics to identify interaction patterns associated with balanced participation and high-quality products.
7. The nine students involved in the small-group trial were subsequently included in the 56-participant main implementation. Their earlier exposure to the workspace may have increased familiarity with the product and should be considered when interpreting the practicality and effectiveness findings.
8. Implementation fidelity was summarized by averaging the two observers' percentage scores, but a formal inter-rater agreement coefficient was not calculated. Future studies should report an appropriate inter-rater reliability or agreement index.

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REFERENCES

Adriyanto, A. R., Ar Razi, A., & Soedewi, S. (2025). Interactions in the collaborative online platform for design studio courses through blended learning. Interaction Design and Architecture(s), 66, 105–134. https://doi.org/10.55612/s-5002-066-005

Bach, A., & Thiel, F. (2024). Collaborative online learning in higher education: Quality of digital interaction and associations with individual and group-related factors. Frontiers in Education, 9, 1356271. https://doi.org/10.3389/feduc.2024.1356271

Battelle for Kids. (2019). Framework for 21st century learning. https://www.battelleforkids.org/wp-content/uploads/2023/11/P21_Framework_Brief.pdf

Branch, R. M. (2009). Instructional design: The ADDIE approach. Springer. https://doi.org/10.1007/978-0-387-09506-6

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

Cortázar, C., Nussbaum, M., Alario-Hoyos, C., Goñi, J., & Alvares, D. (2022). The impacts of scaffolding socially shared regulation on teamwork in an online project-based course. The Internet and Higher Education, 55, 100877. https://doi.org/10.1016/j.iheduc.2022.100877

Dillenbourg, P. (1999). What do you mean by collaborative learning? In P. Dillenbourg (Ed.), Collaborative-learning: Cognitive and computational approaches (pp. 1–19). Elsevier.

Donelan, H., & Kear, K. (2024). Online group projects in higher education: Persistent challenges and implications for practice. Journal of Computing in Higher Education, 36, 435–468. https://doi.org/10.1007/s12528-023-09360-7

Greenstein, L. (2012). Assessing 21st century skills: A guide to evaluating mastery and authentic learning. Corwin.

Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. American Journal of Physics, 66(1), 64–74. https://doi.org/10.1119/1.18809

Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. Educational Researcher, 38(5), 365–379. https://doi.org/10.3102/0013189X09339057

Maldonado López, B., Ledesma Chaves, P., & Gil Cordero, E. (2023). Visual thinking and cooperative learning in higher education: How does its implementation affect marketing and management disciplines after COVID-19? The International Journal of Management Education, 21(2), 100797. https://doi.org/10.1016/j.ijme.2023.100797

Cherbonnier, A., Hémon, B., Michinov, N., Jamet, E., & Michinov, E. (2025). Collaborative skills training using digital tools: A systematic literature review. International Journal of Human–Computer Interaction, 41(7), 4155–4173. doi: 10.1080/10447318.2024.2348227.

De Backer, L., Van Keer, H., De Smedt, F., Merchie, E., & Valcke, M. (2022). Identifying regulation profiles during computer-supported collaborative learning and examining their relation with students' performance, motivation, and self-efficacy for learning. Computers & Education, 179, 104421. doi: 10.1016/j.compedu.2021.104421.

De Backer, L., Van Keer, H., & Valcke, M. (2022). The functions of shared metacognitive regulation and their differential relation with collaborative learners' understanding of the learning content. Learning and Instruction, 77, 101527. doi: 10.1016/j.learninstruc.2021.101527.

Isohätälä, J., Järvenoja, H., & Järvelä, S. (2017). Socially shared regulation of learning and participation in social interaction in collaborative learning. International Journal of Educational Research, 81, 11–24. doi: 10.1016/j.ijer.2016.10.006.

Janssen, J., & Kirschner, P. A. (2020). Applying collaborative cognitive load theory to computer-supported collaborative learning: Towards a research agenda. Educational Technology Research and Development, 68, 783–805. doi: 10.1007/s11423-019-09729-5.

Jeong, H., Hmelo-Silver, C. E., & Jo, K. (2019). Ten years of computer-supported collaborative learning: A meta-analysis of CSCL in STEM education during 2005–2014. Educational Research Review, 28, 100284. doi: 10.1016/j.edurev.2019.100284.

Muñoz, P., Hernández, N., Fuentes-Abeledo, E. J., & González-Sanmamed, M. (2021). Factors influencing students' perceived impact of learning and satisfaction in computer-supported collaborative learning. Computers & Education, 174, 104310. doi: 10.1016/j.compedu.2021.104310.

Ouyang, F., Chen, Z., Cheng, M., Tang, Z., & Su, C. Y. (2021). Exploring the effect of three scaffoldings on the collaborative problem-solving processes in China's higher education. International Journal of Educational Technology in Higher Education, 18, 35. doi: 10.1186/s41239-021-00273-y.

Ransanz Reyes, E., Arana-Cuenca, A., & Manzanal Martínez, A. I. (2025). Recommendations for designing collaborative activities in online higher education: A systematic review. Journal of Technology and Science Education, 15(1), 4–17. doi: 10.3926/jotse.2818.

Rozo-García, H., Alcantar-Nieblas, C., & Ramírez-Montoya, M. S. (2024). Scale to measure student perception in collaborative online international learning experiences: Design and validation. Frontiers in Education, 9, 1401295. doi: 10.3389/feduc.2024.1401295.

Slof, B., van Leeuwen, A., Janssen, J., & Kirschner, P. A. (2021). Mine, ours, and yours: Whose engagement and prior knowledge affects individual achievement from online collaborative learning? Journal of Computer Assisted Learning, 37(1), 39–50. doi: 10.1111/jcal.12466.

Vuopala, E., Näykki, P., Isohätälä, J., & Järvelä, S. (2019). Knowledge co-construction activities and task-related monitoring in scripted collaborative learning. Learning, Culture and Social Interaction, 21, 234–249. doi: 10.1016/j.lcsi.2019.03.011.

Yang, X. (2023). A historical review of collaborative learning and cooperative learning. TechTrends, 67, 718–728. doi: 10.1007/s11528-022-00823-9.

Zheng, X.-L., Huang, J., Xia, X.-H., Hwang, G.-J., Tu, Y.-F., Huang, Y.-P., & Wang, F. (2023). Effects of online whiteboard-based collaborative argumentation scaffolds on group-level cognitive regulations, written argument skills and regulation patterns. Computers & Education, 207, 104920. doi: 10.1016/j.compedu.2023.104920.