

Development of Canva-Based E-LKPD as A Collaborative Workspace to Support Elementary School Students' Problem Solving

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Abstract

This study aims to develop and evaluate the feasibility of Canva-based e-LKPD as a collaborative workspace in *Project Based Learning*, as well as to test changes in students' problem-solving abilities, by describing the post-intervention collaboration profile. The study used a *Research and Development approach* adapted into seven stages and continued with a quasi-experiment using a non-equivalent control group design. The field test involved 29 students in the experimental class and 25 students in the control class, with complete pre-test–post-test data from 29 experimental students and 24 control students. Product feasibility was assessed by material experts, media experts, and practitioners, while problem-solving abilities were analyzed using the Wilcoxon test, Mann-Whitney U, N-gain, and ANCOVA. The validation results showed a very high feasibility level, namely 92.50%–93.99%. Both groups experienced significant changes in problem-solving abilities. These findings indicate that Canva-based e-LKPD is very suitable for use as a collaborative workspace to structure problem-solving activities in the *Project-Based Learning model* in elementary schools.

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INTRODUCTION

Problem-solving skills are an important competency that needs to be developed from elementary school because science learning requires students not only to memorize concepts but also to use information to explain cause-and-effect relationships, determine alternative actions, and evaluate solutions. In the food chain, for example, students are not only required to know the order of producers and consumers, but also need to be able to explain the consequences of changes in one component on other components in the ecosystem. However, based on findings from experts in the field, problem-solving skills in science subjects are still low. This is in line with the findings of Sari Riski Wati et al. (2026) who showed that elementary school students' problem-

solving skills in science subjects are still low, where based on pre-assessment, the average score was only 38.2 out of 100.

Likewise, collaborative skills are important and need to be developed in elementary education, especially in science subjects. Several studies have placed them as a core competency for the 21st century (Utami et al., 2026; Graesser et al., 2018). However, based on expert findings in the field, collaborative skills in science subjects are still low. This is in line with research by Sufiyah et al. (2024) which shows that elementary school students' collaborative skills in science learning are still in the low to very low category. Observations of 30 fourth-grade students showed an average of only 20-50% of each collaborative indicator, which classifies students as less collaborative. Conceptually, collaboration and problem-solving are two interrelated processes in group-based learning. Problem-solving not only requires students to understand the problem and determine solutions, but also requires the exchange of information, alignment of understanding, division of roles, coordination of actions, and evaluation of ideas that emerge during the problem-solving process. In the OECD (2017) *collaborative problem-solving framework*, group success is determined by the ability to build shared understanding, take appropriate action to solve problems, and manage team organization. Therefore, collaboration in this study is positioned not as a stand-alone ability, but as a social process that supports students in carrying out problem-solving stages in a more structured manner.

To overcome these problems, one solution that can be used is to use the *Project Based Learning model* by developing Canva-based E-LKPD to build good problem-solving and collaborative skills of students. Based on research from Rehman (2023) which shows that the *Project Based model* consistently improves problem-solving abilities and collaborative skills of students at various levels of education (see also Chen & Yang, 2019; Zhang & Ma, 2023). Empirical evidence from quasi-experimental studies and classroom action research confirms the significant positive impact of implementing this model (Guo et al., 2020; Kokotsaki et al., 2016). The implementation of *Project Based Learning* in elementary schools shows a very large increase in collaborative skills. In classroom action research in grade III of elementary school, student interaction in groups increased from 0% in the pre-cycle to 81% in cycle II (Hendrawati et al., 2016). The multimodal-based *Project Based Learning model* in grade V of elementary school increased the *Collaborative Problem Solving* (CPS) score from 37.74 to 89.21, far exceeding the control group ($p < 0.001$) (Tri et al., 2026).

The potential of *Project-Based Learning* to improve students' problem-solving and collaboration skills is inseparable from how each stage of learning is designed and supported by appropriate tools. In other words, the success of *Project-Based Learning* is determined not only by the existence of the project, but also by the quality of the scaffolding and media that help students organize ideas, plan activities, and collaborate during the project completion process (Belland et al., 2017; Wood et al., 1976). According to Ferrero, Vadillo, and León (2021), *Project-Based Learning* has significant potential to improve elementary school students' academic achievement. However, its effectiveness depends heavily on the quality of the instructional design at each stage of learning (Lazonder & Harmsen, 2016). Most previous research still focuses primarily on the final project outcome, while supporting students' planning and collaboration processes during project work has not always received adequate attention. This situation highlights the need for tools that can help students organize ideas, assign roles, develop plans, and document

the work process together. In this context, the use of digital technology becomes relevant (Chen et al., 2018). Several studies on the use of Canva in elementary schools indicate that this platform has the potential to support students' creativity, engagement, and digital literacy.

Study previously has show diverse utilization of Canva in learning school basic . Saputra et al. (2022) utilized Canva for Education as a learning medium creative and collaborative , while Amelia and Darmawati (2025) integrated Canva with *Project Based Learning* For support results learning science. Kartini et al. (2026) also developed learning based project with the help of interactive Canva For increase ability think creative and collaborative student school basic findings the show that Canva has potential as a visual medium, a means manufacturing products and support activity collaborative . However , the use of Canva in research the Not yet in a way special directed as room Work structuring collaboration all over traces of the breaking process problem student since identification problems , organizing information , mapping connection cause and effect , arrangement alternative solution , division role , up to reflection group .

Different with study said , research This developing E-LKPD based on canva that doesn't only functioning as a presentation medium or manufacturing digital products , but as room collaborative that integrates stages solution Polya's problem with activity Work group in *Project Based Learning* . Every e-LKPD Canva section designed For externalize the thought process student through recording facts , formulation questions , visualization connection between organisms , giving reasons , selection solutions , and inspections return decision . Thus , the novelty study This lies in repositioning Canva's function of media -oriented product become visual and social scaffolding for the solving process problem collaborative , so that teachers and members group can explore , discuss , and revise the thinking process during learning .

METHOD

This study employed a research and development (R&D) approach aimed at developing, validating, and testing the effectiveness of a Canva-based e-LKPD, positioned as a collaborative space for problem-solving. The R&D approach was chosen because it allows researchers to produce learning products that are systematic, valid, and feasible for implementation in learning practices.

Model (Borg & Gall, 1989) has 10 steps , namely research and information collecting, planning, developing a preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, and dissemination and implementation .

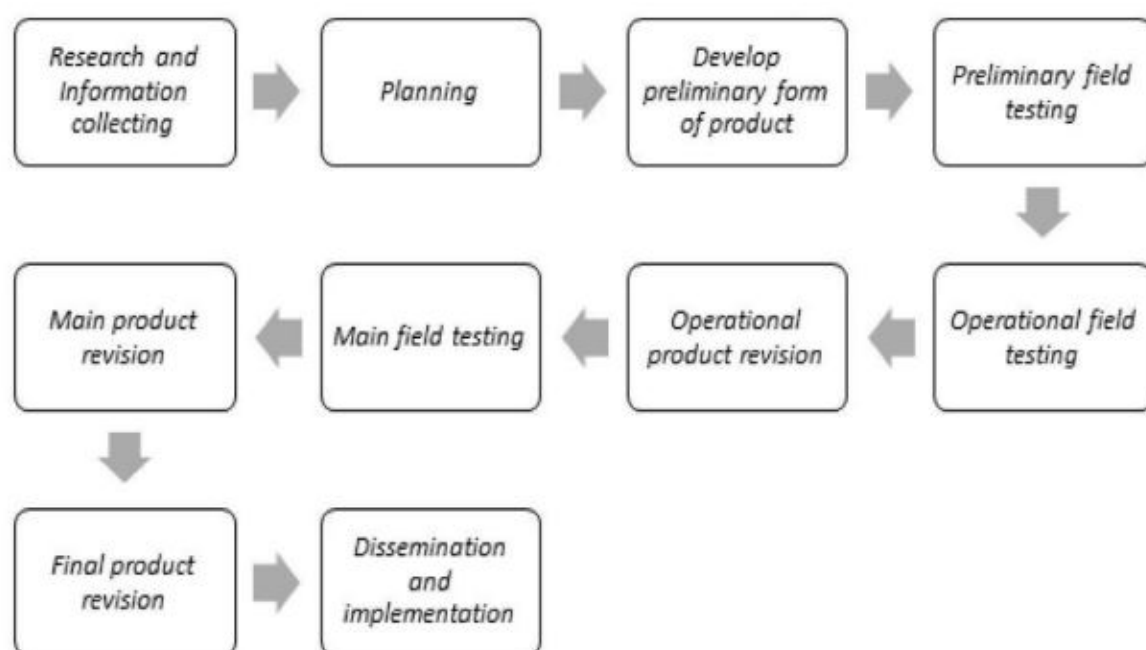


Figure 1 Borg and Gall's research and development steps

Although the original Borg and Gall *Research and Development* (R&D) model contains 10 development steps, this study was adapted and limited to only 7 stages. This adjustment to 7 stages was made to be more relevant to the context of field needs, the urgency of the research, and the time constraints of implementation in elementary schools. The 7 stages that were operationally implemented in this study include: (1) preliminary study and information collection (problem mapping); (2) planning (preparation of product objectives and specifications); (3) development of prototypes/initial product designs; (4) initial trials (validation by material experts, media experts, and practitioners); (5) revision of the initial product based on validator input; (6) main field trials (implementation of *Canva-based E-LKPD* in the experimental class); and (7) revision of the operational product based on the results of the field trials. This adaptation maintains the research's accuracy because all main components of development, namely analysis–design–validation–revision–field trials–evaluation, are still carried out sequentially and documented.

Object Study

Study This implemented in the even semester year The 2026/2027 academic year was conducted at two public elementary schools in Kutawaringin District. School selection was conducted purposively, considering grade level suitability, digital infrastructure readiness, device availability, and the school's willingness to participate in the entire research process. Participants consisted of fifth-grade students: 29 students in the experimental class at SDN A and 25 students in the control class at SDN B. The experimental class used *Canva-based E-LKPD* as a collaborative workspace, while the control class did not use *Canva-based E-LKPD* as a collaborative workspace. Participants were selected using naturally formed classes, so individual randomization was not performed.

Development and Learning Procedures

The first stage maps the problem through learning observations and discussions with teachers. The second stage develops objectives, activity flow, food chain materials, Canva feature specifications, and instrument grids. The third stage produces a Canva-based E-LKPD prototype that connects the Project Based Learning stages with problem-solving activities. In the fourth stage, material experts, media experts, and practitioners review the product. Validator input is used in the fifth stage to improve conceptual accuracy, instructional language, navigation, display, and clarity of student roles. The sixth stage is the main field test for six meetings, while the seventh stage contains operational revisions based on implementation notes and evaluation results. This development pattern maintains the link between field needs, product design, validation, and iterative improvement.

In the food chain lesson, students first read a problem situation about changes in one component of the ecosystem. The group then writes down the information they know and what needs to be addressed. Next, students visualize the food-for-bearance relationship, estimate the consequences of population changes, compare alternative actions, and choose the most feasible solution. The Canva workspace is used to track group decisions so teachers can identify areas requiring scaffolding. This approach aligns with findings that collaborative technology is more effective when linked to a clear activity strategy, rather than simply providing digital tools (Chen & Chen, 2025; Fischer et al., 2013).

Research Instruments

Instrument validity was assessed through *expert judgment* by assessing the suitability of the constructs, indicators, and instrument items. The problem-solving ability test was structured based on Polya's four stages: understanding the problem, developing a plan, implementing the plan, and reviewing it. The collaboration questionnaire was developed based on the OECD's (2017) *collaborative problem-solving framework*.

1. Expert and Practitioner Validation Sheet

A validation sheet was used to obtain an assessment of product quality prior to major implementation. Content experts assessed the appropriateness of the food chain concept, appropriateness of purpose, and quality of problem-solving activities; media experts assessed the readability, navigation, consistency of display, and functionality of Canva; and practitioners assessed classroom implementation, clarity of instructions, time allocation, and appropriateness to student characteristics. The rating scale used four categories ranging from 1 (not appropriate) to 4 (very appropriate). Because the three raters performed different expertise roles and did not all rate identical constructs, their percentages are reported per role and are not aggregated as inter-rater agreement coefficients.

Table 1. Aspects and indicators of expert and practitioner validation sheets

No.	Aspect Evaluation	Key Indicators	Assessor /Scale
1	Quality content and pedagogy	Accuracy draft chain food ; suitability purpose ; alignment activity with Project Based Learning and solving problem .	Subject matter expert / 1-4

No.	Aspect Evaluation	Key Indicators	Assessor /Scale
2	Canva integration as room Work	Compliance feature For recording facts , mapping relationship , rainfall ideas , division roles , and reflection .	Media expert / 1-4
3	Media quality	Readability , consistency appearance , navigation , icons, and usability use .	Media expert / 1-4
4	Eligibility implementation	Clarity instructions , allocation time , implementation , and suitability with characteristics student class V.	Practitioner / 1-4

Source: developed based on (Nieveen, 1999), food chain material requirements, and Canva e-LKPD specifications.

2. Problem Solving Ability Test

The problem-solving ability test consists of seven descriptive questions in the context of the food chain. In this study, problem-solving ability is operationally defined as students' ability to identify and formulate problems, develop solution strategies, implement strategies through cause-and-effect analysis and reasoned decision-making, and re-evaluate the resulting solutions. This operational definition was developed based on Polya's (1973) four stages: understanding the problem, developing a plan, implementing the plan, and re-examining. Each stage is broken down into observable indicators and directly linked to items A1–A7 for the pre-test and B1–B7 for the post-test. Forms A and B use different contexts but have equivalent indicators and levels of reasoning. Each item is scored from 0–3 using an analytic rubric; a maximum total score of 21 is then converted to a 0–100 scale. Scoring takes into account factual accuracy, cause-and-effect relationships, clarity of strategy, use of reasoning or evidence, and the ability to re-examine solutions.

Table 2. Analytical Rubric Scoring Ability Solution to problem

Stage	Score 3	Score 2	Score 1	Score 0
Understand problem	Identifying fact in a way complete and formulate the core of the problem in a way appropriate	Identifying part big facts , but formulation problem Still general	Identifying information in a way limited and not yet show the core of the problem with clear	No answer or answer No in accordance with problem
Make a plan	Develop a logical , systematic and appropriate strategy with draft chain food	Enough strategy in accordance but Not yet complete or not enough systematic	Strategy still limited and lacking in accordance with problem	Not developing a resolution strategy
Carry out plan	Apply draft in a way right , explain connection cause and effect , and provide relevant reasons	Analysis Enough appropriate but reason or connection cause and effect Not yet complete	Analysis only part true and reason still very limited	Answer No appropriate or No show strategy implementation
Inspect return	Evaluate solution , shows weaknesses / improvements , and	Give conclusion and some evaluation , but Not yet deep	The conclusion is still not enough precise and evaluation is very limited	Do not do inspection return or No give conclusion

compile correct
conclusion

Analytical rubric the used in a way consistent in Form A and Form B so difference context question No change criteria assessment on each stages solution problem .

Table 3. Distribution of problem-solving ability test items based on Polya's stage

Polya Stage	Definition operational	Observed indicators	Item
Understand problem	Ability recognize information important in situation problem	Identifying fact relevant and changes that occur	A1 / B1
Understand problem	Ability determine the core of the problem that must be completed	Formulate question main based on situation problem	A2 / B2
Make a plan	Ability determine the necessary concepts For finish problem	Choose connection chain relevant food and information additional required	A3 / B3
Make a plan	Ability develop a resolution strategy in a way logical	Arranging steps settlement in a way systematic	A4 / B4
Carry out plan	Ability apply draft For analyze consequence something change	Explain connection cause and effect between organisms in chain food	A5 / B5
Carry out plan	Ability determine solution based on results analysis	Choose alternative solutions and provide reason or supporting evidence	A6/B6
Inspect return	Ability evaluate accuracy solution	Identifying weakness solution , determine method monitor results , and draw up conclusions	A7 / B7

Source of indicators: (Polya, 1973) . *Forms A and B have equivalent indicators and reasoning demands.*

With this mapping, each test item represents a specific problem-solving process so that the relationship between constructs, operational indicators, and tasks given to students can be clearly traced.

3. Student Collaboration Questionnaire

The collaboration questionnaire consists of 10 Likert-scale statements ranging from 1 to 4, developed from the OECD (2017) *collaborative problem-solving dimensions* and adapted to elementary school students' group work. Indicators include understanding goals and role allocation, active contribution, communication and appreciation of ideas, responsibility and coordination, and group monitoring and reflection. Based on the item direction in the instrument, statements 3, 4, 7, 8, and 9 are negative and were reversed in data processing using a corrected score = 5 - response score. The adaptation process involved mapping the OECD (2017) *collaborative problem-solving dimensions* to observable collaborative behaviors in elementary school students' group work. Statements were worded to reflect the language and context of the students' activities, and then each item was mapped to operational indicators covering goals and role allocation, active contribution, communication and appreciation of ideas, responsibility and coordination, and monitoring and reflection. The alignment between constructs, indicators, and items was checked through *expert judgment* before the instrument was used, ensuring that each statement consistently represented the collaboration dimensions underlying the instrument's development. The questionnaire was administered to 29 students in the experimental class after

the lesson. Because equivalent pre-test and post-test collaboration measures were not available for both classes, these data were used to describe the post-intervention collaboration profile and were not used to test comparative effectiveness between classes.

Table 4. Distribution of collaboration questionnaire statements based on indicators

Indicator	Indicator operational	Statement No.	Amount
Purpose and division role	Understand objective group and agree role before do task .	1(+), 2(+)	2
Contribution active	Give ideas and implement part the task that becomes not quite enough he answered .	3(-), 4(-)	2
Communication and appreciation	Convey opinions , listening , and respecting idea other members .	5(+), 6(+)	2
Not quite enough responsibility and coordination	Finish tasks and coordinate so that the work finished on target.	7(-), 8(-)	2
Monitoring and reflection	Inspect results Work together and determine necessary parts repaired .	9(-), 10(+)	2
Total			10

Indicator source: (OECD, 2017) Statements 3, 4, 7, 8, and 9 are reverse scored.

Data Analysis Techniques

Product feasibility data were analyzed descriptively based on validator assessment percentages and revision notes. Problem-solving ability test scores were obtained from seven items with a maximum score of 21 and converted to a 0–100 scale. The analysis began with descriptive statistics, the Shapiro-Wilk normality test, and Levene's homogeneity test (Ghasemi & Zahediasl, 2012). Non-parametric tests were chosen because some score distributions and pre-test–post-test difference scores did not meet the assumption of normality ($p < 0.05$). Therefore, pre-test–post-test changes within each group were analyzed using *the Wilcoxon signed-rank test* , while inter-group comparisons used *the Mann-Whitney U test* . N-gain was calculated to describe the magnitude of relative improvement (Hake, 1998). As a sensitivity analysis to differences in baseline conditions, ANCOVA was used with post-test scores as the dependent variable and pre-test as the covariate (Van Breukelen, 2006) after the assumption of homogeneity of regression slopes was checked. The significance level was set at 0.05 and effect sizes were reported along with p-values (Fritz et al., 2012; Lakens, 2013). Collaboration data were analyzed descriptively because only post-intervention measurements were available in the experimental class. Negative items 3, 4, 7, 8, and 9 were reverse scored before the total score was converted to a percentage.

RESULTS AND DISCUSSION

Results

Development Process Product and Feasibility Study

Analysis need identify two problems main . First , students Not yet consistent change information on the problem chain food become step structured solution . Second , the activity group Not yet give clear trail about ideas , reasons , division tasks and sections necessary work repaired . Based on need mentioned , the E-LKPD prototype is based on canva developed as room Work collaborative that includes identification areas facts , formulation questions , mapping chain food , alternative solution , division roles , and reflection .

Prototype furthermore through validation formative by experts materials , media experts , and practitioners . Validation No only produce score feasibility , but also use as base revision product . Material expert give input especially on accuracy term ecology , suitability objective learning , and clarity activity solution problem . Media experts emphasize consistency appearance , icons, readability , and navigation between pages . Meanwhile that , practitioner give input about long instructions , clarity distribution tasks and implementation student activities class V. Input the used For repair prototype before field testing .

Table 5. Feedback and Revision Track Product

Stage / assessor	Bait come back main	Revisions made
Analysis need	Student difficulty organize facts , planning solutions , and show the work process group	E-LKPD is compiled become room Work sequentially : facts – questions – maps relationship – solution – division role – reflection
Subject matter expert	Ecological terms and some instructions need clarified to suit with draft chain food	Material terms repaired , goal clarified , and activities aligned with the process of solving problem
Media expert	Appearance , icons, and navigation inter-page need more consistent	Icons and layout standardized as well as navigation inter-page clarified
Practitioner /teacher	Instructions too long on some parts and divisions task group need more clear	Instructions simplified and instructions distribution role clarified
Revision operational	Product need easy used during activity groups in class	Usage flow , instructions work , and connectedness inter-section E-LKPD based canva perfected based on notes implementation

The process show that revision done in a way gradual and not only based on percentage validation . Each input used For repair different aspects from products , starting from accuracy content , quality interface , up to implementation in learning . The workspace is also clarified so that students can distinguish areas for facts , questions , ideas, plans , and reflections . Thus ,

validation expert functioning as evaluation formative that produces change real in design product before used in field tests .

After the revision process , validation end show that product get very worthy category from all over assessor .

Table 6. Summary of Final Product Validation Results

Validator		Percentage end	Interpretation
Subject expert	matter	92.50%	Very worthy
Media expert		93.99%	Very worthy
Practitioner /teacher		92.64%	Very worthy

Validation results show that expert material give very high rating to accuracy concept , purpose learning , and suitability activity solution problem . Media experts assess that Canva's interface , navigation , and functionality as room Work collaborative has fulfil criteria eligibility , whereas practitioners evaluate instructions and flow activity can applied to students class V. Third results the become base For continue product to field test stage . However , the percentage eligibility No interpreted as proof effectiveness learning , but rather as proof that product has fulfil condition content , media, and implementation For implemented .

Problem Solving Ability in Experimental and Control Classes

The analysis was conducted on 29 students in the experimental class and 24 students in the control class who had complete score pairs. Descriptive statistics in Table 7 show that both classes experienced score increases, but the initial patterns were different: the control class started with a higher pre-test mean, while the absolute increase in the experimental class was greater.

Table 7. Descriptive Statistics of problem-solving abilities by group

Group	Measurement	N	Minimum	Maximum	Mean	Elementary School	Median
Experiment	Prates	29	14.29	57.14	39.90	13.73	42.86
Experiment	Post-test	29	19.05	76.19	53.86	14.40	57.14
Control	Prates	24	28.57	76.19	48.21	12.35	47.62
Control	Post-test	24	28.57	80.95	55.56	13.22	57.14

Conceptually, the problem-solving ability test encompasses four main indicators based on Polya's stages: understanding the problem, developing a plan, implementing the plan, and reviewing. However, the analysis of the results in this study was conducted using a total score of seven items, so changes in each indicator were not analyzed separately. Therefore, an increase in the total score should not be interpreted as evidence that all indicators improved in the same proportion or that one indicator experienced the greatest improvement. Analysis per indicator requires pre-test–post-test scores on each item or grouping items based on Polya's stages.

Table 7 shows that the experimental class mean increased from 39.90 to 53.86, or an increase of 13.96 points. In the control class, the mean increased from 48.21 to 55.56, or an increase of 7.34 points. The experimental class median moved from 42.86 to 57.14, while the control class median moved from 47.62 to 57.14. Thus, both classes moved in a positive direction, but the

experimental class showed a mean increase that was nearly twice as large. However, the initial mean difference of approximately 8.31 points should be taken into account before drawing comparative conclusions.

The assumption test in Table 7 shows that the pretest, posttest, and difference scores in the experimental class were not all normally distributed; the difference scores in both classes were also non-normal. The pretest and posttest variances between classes remained homogeneous based on *Levene's test*. Therefore, the primary tests of within-class change and between-class comparisons used nonparametric procedures.

Table 8. Tests of Normality and Homogeneity of Variance

Group / Variable	Shapiro-Wilk	Df	Sig.	Levene	Sig. Levene	Decision
Experiment - pre-test	0.898	29	0.009	0.493	0.486	Abnormal; variance homogeneous
Experiment - post-test	0.895	29	0.007	0.004	0.947	Abnormal; variance homogeneous
Experiment - difference	0.869	29	0.002	-	-	Abnormal
Control - pre-test	0.923	24	0.069	0.493	0.486	Normal; variance homogeneous
Control - post-test	0.966	24	0.579	0.004	0.947	Normal; variance homogeneous
Control - difference	0.847	24	0.002	-	-	Abnormal

Under initial conditions, the Mann-Whitney U test yielded $U = 239.50$ with $p = 0.051$. This value did not exceed the 0.05 significance level, but was very close to it and was consistent with the descriptively observed pre-test mean differences. Therefore, the article does not assume the two classes were identical at the start of the study; initial conditions were controlled for using ANCOVA as a sensitivity analysis.

Pretest-posttest changes in each class were analyzed using the Wilcoxon signed-rank test. A summary of the ranks and test statistics is shown in Table 8. In the experimental class, there were 17 positive ranks, one negative rank, and 11 ties; in the control class, there were 12 positive ranks, three negative ranks, and nine ties.

Table 9. Wilcoxon Signed-Rank Test in each group

Group	Positive	Negative	Ties	Z	Sig. (2-tailed)	Effect size r
Experiment	17	1	11	-3,681	< 0.001	0.684
Control	12	3	9	-2,531	0.011	0.517

The Wilcoxon test results showed significant changes in both groups. The experimental class produced a $Z = -3.681$, $p < 0.001$ with an effect size of $r = 0.684$, while the control class produced a $Z = -2.531$, $p = 0.011$ with an $r = 0.517$. This means that learning in both classes is related to increased problem-solving abilities, but the direction of change in the experimental class was more consistent and the effect size within its group was larger. This finding does not mean that the experimental treatment is comparatively superior.

Collaboration Skills Profile of Experimental Class Students

Collaboration skills were analyzed from a 10-statement questionnaire completed by 29 students in the experimental class after the implementation of Canva's e-LKPD. Five negative items (3, 4, 7, 8, and 9) were reversed before the scores were summed. After correcting the item direction, the average total score of students was 26.93 out of a maximum score of 40 (SD = 2.94), with a minimum score of 21 and a maximum of 33. The overall achievement percentage was 67.33%, so the experimental class' collaboration profile was in the good category. Details of each indicator are presented in Table 9.

Table 10. Collaboration skills profile of experimental class students after learning

Indicator collaboration	Item	Average score / item	Percentage	Interpretation
Purpose and division role	1-2	3.24	81.03%	Very good
Contribution active	3-4	2.45	61.21%	Good
Communication and mutual value	5-6	2.83	70.69%	Good
Not quite enough responsibility and coordination	7-8	2.14	53.45%	Enough
Monitoring and reflection	9-10	2.81	70.26%	Good
Overall	1-10	2.69	67.33%	Good

Table 10 shows that goals and role allocation were the strongest aspects, with a score of 81.03% (very good). This indicates that most students were able to understand the goals of group work and agree on the division of roles while working on the Canva-based E-LKPD. Communication and mutual respect reached 70.69%, while monitoring and reflection reached 70.26%; both were in the good category and demonstrated that students were relatively capable of discussing, listening to ideas, and reviewing group work. Active contribution achieved 61.21% and was still in the good category, but near the bottom limit of the category. The lowest achievement was in responsibility and coordination, at 53.45% (sufficient). This pattern indicates that the existence of a shared workspace does not automatically ensure equal division of work and completion of responsibilities among all members. Because the questionnaire was only administered after the learning in the experimental class, these findings are treated as a post-intervention collaborative profile and not as evidence of improvement or superiority compared to the control class.

DISCUSSION

The Meaning of Product Feasibility. The assessments of material experts, media experts, and practitioners, all above 92%, indicate alignment between the appropriateness of the food chain concept, media function, and usability in the classroom. Within the framework of product quality, evidence of validity and practicality are prerequisites before effectiveness is tested, but they are not synonymous with comparative effectiveness (Nieveen, 1999). A product can be very feasible in design but still requires field evidence that shows whether the addition of digital features produces learning benefits over comparison learning.

Significance of Improvement in Both Classes. Both groups experienced significant changes from pre-test to post-test. This finding is understandable because both groups experienced a *Project Based Learning structure* that placed students in problem-solving, discussion, solution-building, and reflection. In the food chain topic, this activity shifted learning from simply memorizing the sequence of organisms to analyzing cause-and-effect relationships when one component of the ecosystem changes. This pattern is consistent with evidence that *Project Based Learning* can support learning outcomes and problem-solving skills when tasks and implementation support are well-designed (Ndiung & Menggo, 2024; Hmelo-Silver, 2004). Because the control class also experienced *Project Based Learning*, the improvement in the control group is not an anomaly, but rather demonstrates the contribution of the project learning structure itself.

These findings have both similarities and differences with previous problem-solving research. Similarly, the results of this study align with those of Ndiung and Menggo (2024), who showed that Project-Based Learning can support students' problem-solving skills when learning activities are structured. In this study, both groups also demonstrated significant pretest–posttest changes after participating in project-based learning. However, the difference lies in the strength of the comparative evidence. In this study, the additional use of Canva-based e-LKPD did not produce a significant advantage over Project-Based Learning without the Canva workspace. This difference suggests that the benefits of Project-Based Learning on problem-solving can emerge in both settings, while the additional contribution of technology needs to be demonstrated through direct comparison with a comparison group that also received active learning.

Experimental Numerical Gains, but Not Significant. The mean increase in the experimental class was greater than that of the control class, and the Wilcoxon effect size in the experimental class was also higher. However, the N-gain comparison and ANCOVA did not show significant differences between groups. This pattern suggests that the collaborative workspace of Canva-based E-LKPD may help some students organize facts, visualize trophic relationships, and maintain a track record of group thinking, but these additional benefits are not yet consistent enough across students to produce a detectable comparative advantage. These results complement research on Canva-assisted *Project Based Learning* that reports benefits on learning outcomes and collaboration by suggesting that digital benefits need to be differentiated between pedagogical feasibility, group improvements, and advantages over active comparators (Amelia & Darmawati, 2025).

From an educational perspective, the within-group effect sizes indicate that pretest–posttest changes are not simply small numerical changes. The *r values* of 0.684 in the experimental group and 0.517 in the control group indicate significant changes in each group during the learning process. However, after controlling for baseline conditions, the between-group effect size via ANCOVA only reached a *partial $\eta^2 = 0.013$* . This suggests that the additional contribution of the Canva-based e-LKPD to the intergroup differences in outcomes was relatively small given the context and duration of the intervention in this study. Therefore, the educational significance of these findings lies in the potential of e-LKPD to structure the learning process, not in evidence that using Canva yields substantial learning gains compared to Project-Based Learning without a Canva workspace.

Why Canva is still pedagogically relevant. theoretically , Canva's function is as room Work collaborative can explained through the externalization process cognitive . At this stage understand problems , students move information from stimulus to visual form in the form of facts , questions , and relationships between organisms so that complex information become more easy organized . At this stage compile plans , visual representations help student connect cause and effect as well as compare alternative completion . At this stage carry out plan , space Work together allows student linking proof with decisions taken , while at stage inspect back , part reflection help student review consistency between problems , reasons , and solutions . Thus , Canva does not only functioning as a presentation medium , but as *scaffolding* cognitive that helps create a thinking process student visible , structured , and accessible revised (Ainsworth, 2006; Sweller, 1988) .

Function it also has dimensions social . Because of the representation Work is at in One room together , individual ideas can viewed , compared , discussed , and improved by members group . This process allows student build understanding together at a time give teachers a more visible footprint clear For give *scaffolding* (Suthers & Hundhausen, 2003) . Thus , Canva functions in study This connecting cognitive processes solution problem based on Polya's stages with social processes collaborative during *Project Based Learning* .

However, the presence of technology does not automatically result in higher learning outcomes. Canva provides *affordances* in the form of visualizations, shared workspaces, and thought process traces, but these benefits only emerge if students actually use these features to organize information, provide reasoning, compare alternatives, and revise solutions (Kreijns et al., 2003). If technology is used solely as a place to write or display work, its contribution to cognitive processes is limited. Furthermore, the quality of teacher *scaffolding* , clarity of role assignments, students' familiarity with digital tools, and the consistency of each group member's involvement can influence the extent to which digital features are meaningfully utilized (Mishra & Koehler, 2006). Therefore, Canva's pedagogical value is better understood as a support for the learning process rather than as a factor that independently guarantees improved academic achievement.

Collaborative Profile Significance. The post-intervention collaborative profile was in the good category, but the pattern between indicators suggests that collaborative skills did not develop uniformly. Strengths in goals and role allocation indicate that the Canva-based E-LKPD structure helped groups establish a clear work orientation from the outset. In the food chain topic, role allocation allowed students to address different areas, such as identifying producers and consumers, tracking population changes, or examining group reasoning. The good communication and monitoring achievements also support Canva's function as a shared artifact: ideas, trophic relationships, and decisions are visible to all members, making them easier to discuss and review. However, accountability and coordination were the weakest aspects. This finding is important because collaborative platforms do not necessarily guarantee equitable contributions (Johnson & Johnson, 2009); students still need scaffolding in the form of rotating role allocations, deadlines for each section, and review of individual contributions to prevent work from becoming concentrated in certain members (Vogel et al., 2017). This interpretation is in line with the view (OECD, 2017) that collaboration includes shared understanding, appropriate action, and the formation and maintenance of team organization, and with the review of Cherbonnier et al (2024)

that the quality of digital collaboration depends on task structure and interaction support, not simply the presence of sharing features.

The Significance of Low N-Gain and Ties. The N-gain for both classes remains low despite significant within-group tests. This suggests that statistical significance does not equate to depth of mastery. Many students are moving in the right direction, but their improvement has not yet utilized a large portion of the available score space. Eleven ties in the experimental and nine ties in the control also indicate heterogeneity in response. In other words, the instructional design has not worked equally well for all students; some students still need more explicit assistance in transforming food chain images into cause-and-effect reasoning and solution evaluation.

Implications for collaborative workspace design: For Canva's contribution to be more tangible than traditional *Project-Based Learning*, digital templates need to provide more than just space for typing or decorating. Each page needs to trigger cognitive activities that are not easily skipped: identifying facts, writing core questions, plotting food-to-be-eaten relationships, predicting population changes, incorporating evidence, comparing alternatives, and reexamining conclusions. The literature on digitally aided collaborative training also emphasizes that the benefits of technology emerge when interactions, roles, and task support are explicitly designed, not because of the platform itself (Cherbonnier et al., 2024; Kirschner et al., 2018). Thus, technology serves as a scaffolding for the thinking process, not simply a medium for presenting the final product.

The findings of this study emphasize the importance of controlling for baseline conditions in quasi-experimental studies in elementary education. Because the study used intact, established classes, differences in pre-test scores between groups may arise and should not be ignored. Therefore, future research should combine initial equivalence checks with analyses that control for baseline scores, such as ANCOVA, and report effect sizes along with significance values. Future studies should also ensure complete pre-test–post-test paired data, measure the primary outcome equally in the experimental and control groups, and monitor *fidelity of implementation* to ensure that differences in outcomes can truly be attributed to the intervention (O'Donnell, 2008). Using a longer intervention duration and, where possible, involving more than one class in each condition would also strengthen the internal and external validity of quasi-experimental research in elementary education.

Limitations and Limitations of Interpretation. First, classes were not randomly assigned, so selection bias remains. Second, although the control class reportedly had 25 students, the original data file contained only 24 complete score pairs; the analysis did not artificially impute missing values. Third, the intervention lasted six sessions, so the benefits of the collaborative workspace may not have accumulated optimally. Fourth, collaboration was only measured once after the instruction in the 29 experimental class students. Therefore, collaborative scores only reflect post-intervention conditions and cannot be used to infer improvement from baseline or superiority over the control class. Further research is needed using complete data pairs, a longer duration, and pretest-posttest collaborative measures in both groups.

In addition, research This Not yet measure students' digital literacy formally (Ng, 2012). Differences experience in use digital devices and Canva can influence speed student understand navigation, organizing information, as well as participate in room Work collaborative. Thus,

some variation response student Possible No only related with ability solution problems , but also with level familiarity to technology used .

readiness is also not yet measured as variables research . Teachers' ability in give *scaffolding* , directing discussion , monitoring contribution groups , as well as utilise footsteps digital work can influence quality implementation . Therefore that , research furthermore need enter students' digital literacy and teachers' readiness as variables supporters for influence E-LKPD design based on canva can separated with more clear from influence ability use technology and quality facilitation learning .

CONCLUSION

The Canva-based e-LKPD was successfully developed as a collaborative workspace for *Project-Based Learning* on food chains and received a very high level of feasibility from subject matter experts, media experts, and practitioners. The product is suitable for use in facilitating fact-recording, mapping trophic relationships, solution planning, role assignment, and group reflection. In the complete data, the experimental class ($n = 29$) increased from $M = 39.90$ to $M = 53.86$, while the control class ($n = 24$ of 25 enrolled students) increased from $M = 48.21$ to $M = 55.56$. Wilcoxon showed significant changes in both the experimental ($Z = -3.681$; $p < 0.001$; $r = 0.684$) and control ($Z = -2.531$; $p = 0.011$; $r = 0.517$). The experimental class's N-gain (0.232) was numerically higher than the control (0.142), but both were in the low category. The collaboration profile of the 29 experimental class students after learning reached an average of 26.93 out of 40 ($SD = 2.94$) or 67.33% and was in the good category after the reversal of the negative item scores. The highest achievement was in the aspects of goals and role allocation (81.03%), while the lowest achievement was in responsibilities and coordination (53.45%). These results indicate that the Canva-based e-LKPD provides a supportive environment for collaborative work, but equal distribution of responsibilities still requires teacher scaffolding. Because collaboration was only measured in the post-intervention experimental class, these results should not be interpreted as evidence of improvement or superiority between classes. The comparative superiority of the experimental class in problem-solving ability has not been statistically proven. The difference in individual N-gain was not significant ($U = 430.50$; $p = 0.132$), and after the pre-test was controlled through ANCOVA, the group effect was also not significant, $F(1,50) = 0.643$; $p = 0.427$; partial eta squared = 0.013. Therefore, this study supports the feasibility and pedagogical potential of Canva-based E-LKPD, but does not support the claim that the treatment is more effective than *Project Based Learning* without collaborative workspace in this field test.

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