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The Effectiveness of Nearpod as an Instructional Medium in Improving Science Learning Outcomes among Eighth-Grade Students at SMP Negeri 2 Kulo, Sidenreng Rappang Regency

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Abstract: Penelitian ini mengkaji perubahan hasil belajar Ilmu Pengetahuan Alam (IPA) setelah penerapan pembelajaran berbantuan Nearpod pada siswa kelas VIII SMP Negeri 2 Kulo, Kabupaten Sidenreng Rappang, Indonesia. Penelitian menggunakan pendekatan kuantitatif dengan desain praeksperimental *one-group pretest-posttest* yang melibatkan seluruh 42 siswa dari dua kelas yang sudah terbentuk. Tes pilihan ganda sebanyak 20 butir digunakan untuk mengukur pemahaman materi pengenalan biologi sel, sedangkan dua angket dengan masing-masing lima pernyataan berjawaban ya atau tidak digunakan untuk mendeskripsikan partisipasi siswa dan perubahan perilaku yang mereka rasakan. Dalam penyusunan artikel ini, 42 pasangan nilai pada skripsi sumber dihitung ulang karena terdapat ketidaksesuaian ringkasan nilai pretest antara abstrak dan tabel agregat. Hasil perhitungan ulang menunjukkan peningkatan nilai rata-rata dari 44,88 (SD = 15,83) menjadi 85,24 (SD = 4,68), dengan kenaikan sebesar 40,36 poin. Seluruh siswa mengalami peningkatan dan mencapai batas ketercapaian pembelajaran sekolah sebesar 80 pada posttest, sedangkan pada pretest tidak ada siswa yang mencapai batas tersebut. Nilai *normalized gain* yang dihitung berdasarkan rata-rata kelompok sebesar 0,732. Analisis eksploratif berpasangan menghasilkan t(41) = 17,30, p < 0,001, dengan interval kepercayaan 95% untuk rata-rata peningkatan sebesar 35,65–45,07 poin. Respons positif terhadap angket berkisar antara 88,10% hingga 100%, meskipun terdapat satu pernyataan dengan ketidaksesuaian jumlah respons yang belum terselesaikan. Temuan ini menunjukkan peningkatan hasil belajar jangka pendek yang besar selama pembelajaran berbantuan Nearpod serta persepsi positif siswa. Namun, ketiadaan kelompok pembanding, dokumentasi perlakuan yang belum lengkap, dan tidak dilaporkannya bukti validasi tes menyebabkan peningkatan tersebut belum dapat dikaitkan secara khusus dengan penggunaan Nearpod. Penelitian dengan kelompok kontrol, instrumen tervalidasi, dan pengukuran lanjutan setelah jeda waktu direkomendasikan.

Kata kunci: Nearpod; hasil belajar IPA; media pembelajaran interaktif; biologi sel; pendidikan menengah pertama.

Abstract: This study examined changes in science achievement following Nearpod-supported instruction among eighth-grade students at SMP Negeri 2 Kulo, Sidenreng Rappang Regency, Indonesia. A quantitative pre-experimental one-group pretest-posttest design involved all 42 students from two intact classes. A 20-item multiple-choice test assessed introductory cell biology, and two five-item binary-response questionnaires described student participation and perceived behavioral changes. For this article, the 42 paired scores in the source thesis were recalculated because its abstract and aggregate table contained inconsistent pretest summaries. The reconstructed mean increased from 44.88 (SD = 15.83) to 85.24 (SD = 4.68), a gain of 40.36 points. All students improved and reached the school's achievement threshold of 80 at posttest, compared with none at pretest. The normalized gain calculated from the group means was 0.732. An exploratory paired analysis yielded t(41) = 17.30, p < .001, with a mean-gain 95% confidence interval of 35.65–45.07 points. Positive questionnaire responses ranged from 88.10% to 100%, although one item contained an unresolved response-total discrepancy. These findings indicate substantial short-term improvement during Nearpod-supported instruction and favorable student perceptions. However, the absence of a comparison group, incomplete intervention documentation, and unreported test-validation evidence prevent attribution of the improvement specifically to Nearpod. Controlled studies incorporating validated instruments and delayed assessments are recommended.

Keywords: Nearpod; science achievement; interactive instructional media; cell biology; junior secondary education

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INTRODUCTION

Science education at junior secondary level asks students to connect observable phenomena with explanations that frequently involve structures they cannot see directly. Introductory cell biology illustrates this challenge. Students must recognize cells as structural and functional units, distinguish plant and animal cells, and relate organelles to their roles. Remembering unfamiliar terminology is only part of this task. Learners also need opportunities to interpret representations, compare examples, and revise mistaken ideas. When classroom instruction offers few occasions to respond, teachers may struggle to identify whether students understand a diagram or merely recognize its labels. Instructional media therefore deserve attention as components of teaching that can make student thinking more visible.

At SMP Negeri 2 Kulo in Sidenreng Rappang Regency, the source thesis identifies concerns about low science achievement and limited interactive technology use (Jusriani, 2026). These concerns motivated an investigation of Nearpod-supported instruction with eighth-grade learners. The school context matters because evidence from one educational setting does not automatically transfer to another. Device availability, teacher preparation, lesson content, and familiarity with digital tasks can influence how students participate. An investigation within an existing school cohort can describe what happened under local conditions, even when its design cannot establish a definitive causal effect. Such evidence is useful when its scope and limitations are communicated explicitly.

Nearpod offers a setting in which teachers can combine instructional presentations with questions and student responses. Its educational promise lies in the relationship between explanation and participation. A lesson can ask students to examine a representation and then respond to a question about it, making opportunities for understanding more frequent than in an uninterrupted presentation. Nevertheless, the availability of interactive functions should not be confused with effective instructional design. Teachers must decide which representations clarify a concept, which questions reveal understanding, and how responses inform subsequent explanation. The platform provides a delivery environment, whereas the instructional sequence determines how that environment serves learning objectives.

Research on multimedia learning provides one reason to investigate this arrangement. Mayer (2017) explains how coordinated words and graphics can support learning when instructional design manages processing demands. Noetel et al. (2022) likewise synthesize evidence that multimedia design principles influence learning. For cell biology, this perspective suggests that a labeled image becomes more useful when students connect each structure with an explanation of its function. Excessive decoration or poorly coordinated information may instead distract attention. Consequently, the relevant educational question concerns the quality of the learning activity supported by digital media, rather than the mere presence of technology in a classroom.

A second rationale involves opportunities for active responding and assessment. Black and Wiliam (1998) place assessment within teaching processes that use evidence of understanding to guide instruction. Hattie and Timperley (2007) show that feedback requires attention to what information is provided and how it supports progress. These perspectives suggest a plausible

role for embedded questions in a science lesson. Students can attempt an answer, recognize uncertainty, and seek clarification before a final assessment. This account remains a proposed mechanism in the present study because the thesis does not provide detailed response logs or records of feedback quality. It offers a conceptual basis for investigation, not proof of what caused the observed score changes.

Regional scholarship also makes the investigation relevant. Studies involving Hermansyah and collaborators have examined digital media in science and other school subjects. Sanariya et al. (2023) investigated Sparkol VideoScribe in junior secondary science, while Nasli et al. (2023) examined Animaker in another local science setting. Rahmatullah et al. (2023) considered Smart Apps Creator, and Wahyuni et al. (2023) studied Powtoon. Together, these publications show sustained regional interest in technology-supported instruction. They provide contextual precedents, but their different platforms, learner groups, and research designs mean that their findings cannot establish the effectiveness of Nearpod for the present cohort.

Other local studies extend this context beyond science. Nur Hikmah D et al. (2023) examined Canva-supported citizenship education, Usman M et al. (2026) investigated Visme in arts and culture, and Abdul Jalil Jum'uatullaila et al. (2025) studied Quizizz in English learning. Hermansyah et al. (2026) addressed digital public-speaking materials, while Syamsunir et al. (2026) considered interactive Smart Board use. These reports connect instructional media with achievement, participation, or practical classroom use. Their value here is to situate the investigation within local instructional development. Subject-specific evidence remains necessary because success in one domain does not demonstrate improvement in cell-biology understanding.

More directly, Nearpod research has addressed elementary achievement, Indonesian language learning, mathematics, and scientific literacy. Pramesti et al. (2023), Oktaviani and Nurhamidah (2023), Aryani et al. (2023), and Ellianawati et al. (2025) provide examples of this developing literature. However, learner level, disciplinary content, implementation, and outcome measures differ across these studies. The present investigation contributes a clearly bounded description of an entire eighth-grade cohort at SMP Negeri 2 Kulo. Its contribution is strengthened by reconstructing the student-level results rather than repeating inconsistent summary values in the thesis. Accurate reporting is necessary before educational implications can be evaluated responsibly.

Accordingly, this article examines three questions. First, how did students' science test scores change after Nearpod-supported instruction? Second, how did achievement relative to the school's threshold differ between pretest and posttest? Third, what did students report about participation and perceived behavioral changes? Achievement is operationalized through a 20-item test on introductory cell biology, rather than a comprehensive measure of scientific literacy. Questionnaire responses describe perceptions after instruction, rather than objectively measured changes in motivation. The study is intended to inform local instructional decisions and guide stronger subsequent research. Any claim of effectiveness is therefore restricted to observed short-term improvement within the participating cohort, with alternative explanations retained throughout interpretation.

The distinction between a promising classroom outcome and a demonstrated platform advantage is central to this purpose. A school may reasonably continue an approach that accompanies better achievement while still gathering evidence about its costs, accessibility, and comparative value. Reporting the present findings with this distinction allows teachers to act on local observations without assuming that the same results will necessarily occur in every future class.

Literature Review

Multimedia learning theory provides a framework for explaining why instructional representations may support science understanding. Mayer (2017) identifies design principles concerning the selection, organization, and coordination of verbal and visual information. Applied to cell biology, these principles encourage teachers to place explanations close to relevant structures, introduce essential terms, and divide complex material into manageable segments. A digital presentation becomes educationally meaningful when it helps learners connect a structure with a function. It should not require them to search across unrelated screens or interpret unnecessary visual elements. These principles guide design decisions but do not imply that every multimedia lesson produces the same learning benefit.

Noetel et al. (2022) reinforce the importance of design quality through a synthesis of multimedia reviews. This broader evidence supports considering how materials are organized, rather than treating technology as a uniform intervention. Regional studies offer complementary context: Nasli et al. (2023) investigated animation-supported science instruction, and Sanariya et al. (2023) examined video-based representations in science. Hermansyah and Saleh (2025) also explored picture puzzles for learning about human body functions. These studies address different media and age groups, yet collectively highlight the instructional importance of representations and learner activity. They should be read as contextual parallels, not direct replications of Nearpod-based cell instruction.

Active responding and formative assessment

Active learning requires students to do intellectual work with content. Selecting an answer, explaining a distinction, or identifying an error can reveal understanding that passive exposure leaves uncertain. Freeman et al. (2014) report benefits of active learning in undergraduate science, engineering, and mathematics; transfer to junior secondary education nevertheless requires caution. Digital questioning can create opportunities for active responding, but engagement depends on the thinking required. A question that asks students to explain why chloroplasts distinguish plant cells demands different reasoning from one that asks them to identify a familiar word. The present thesis measures test achievement without separately assessing these cognitive processes.

Formative assessment adds an instructional purpose to student responses. Black and Wiliam (1998) emphasize using evidence to support learning, and Hattie and Timperley (2007) discuss the conditions under which feedback can help. Agarwal et al. (2021) synthesize classroom research on retrieval practice, providing a further rationale for asking learners to recall information. Together, these perspectives suggest that repeated responding may support learning when it is aligned with content and followed by useful explanation. Nearpod can host such activities, but the current evidence cannot determine whether feedback, retrieval,

visual explanation, or their combination contributed most. That distinction would require more detailed implementation measures.

Empirical evidence concerning Nearpod

Nearpod-specific research includes development and classroom-evaluation studies. Feri and Zulherman (2021) developed a Nearpod-based science e-module on energy and its changes, addressing instructional product development. Pramesti et al. (2023) similarly investigated interactive Nearpod materials for elementary learners. These studies support examining the feasibility and classroom relevance of Nearpod-supported resources. Their developmental emphasis differs from the present study's comparison of scores before and after instruction. Product validation and achievement evaluation answer related but distinct questions: a resource can be judged usable without establishing that its platform caused a learning advantage over alternative teaching arrangements.

Oktaviani and Nurhamidah (2023) investigated Nearpod in Indonesian language instruction, while Aryani et al. (2023) examined web-based Nearpod in mathematics. Ellianawati et al. (2025) addressed scientific literacy and numeracy concerning renewable energy. These publications indicate that Nearpod has been studied across subjects and outcome types. However, their findings cannot be combined informally into a universal effect estimate. Science literacy, mathematical communication, perceived motivation, and multiple-choice achievement represent different constructs. This article therefore uses prior Nearpod work to establish relevance and frame possible explanations, while keeping its own conclusions tied to the cell-biology test and questionnaire evidence available.

Regional evidence and the remaining gap

Local publications provide practical comparisons. Putri et al. (2026) examined Genially in junior secondary science, whereas Rahmatullah et al. (2023) addressed Smart Apps Creator. Studies of Canva, Visme, Quizizz, Smart Boards, and digital public-speaking resources illustrate a wider local interest in instructional media (Nur Hikmah D et al., 2023; Usman M et al., 2026; Abdul Jalil Jum'uatullaila et al., 2025; Syamsunir et al., 2026; Hermansyah et al., 2026). Their relevance lies in shared educational conditions and attention to participation or achievement. They offer no basis for ranking these platforms without comparable participants, content, teaching time, and assessment procedures.

The remaining gap is therefore specific: a transparent account of score changes and student perceptions during Nearpod-supported introductory cell biology at SMP Negeri 2 Kulo. The conceptual expectation is that coordinated representations and opportunities to respond may accompany better achievement. The empirical test available is a one-group before-and-after comparison. Hake's (1998) normalized gain can describe improvement relative to remaining score space, while Lakens (2013) informs effect-size reporting. Neither statistic removes design limitations. A defensible account must distinguish observed improvement, plausible instructional explanations, and causal conclusions that require a comparison condition. This distinction structures the methods, results, and discussion presented below.

Method

The original investigation used a quantitative pre-experimental one-group pretest-posttest design at SMP Negeri 2 Kulo, Sidenreng Rappang Regency, South Sulawesi, Indonesia (Jusriani,

2026). Students completed an initial test, received Nearpod-supported science instruction, and completed a final test. Two intact classes contributed to the same intervention cohort; neither served as a control. Chapter IV dates the research to June–August 2026. Because the scheduling section gives a conflicting semester description, this article retains the reported calendar period and does not assign a semester. The article also includes an explicitly identified secondary recalculation of the thesis tables.

Participants and instructional content

The population comprised all 42 eighth-grade students, and total sampling included the entire cohort. Class VIII.1 contained 21 students, comprising 11 girls and 10 boys; class VIII.2 contained 21 students, comprising 12 girls and nine boys. Thus, the cohort included 23 girls and 19 boys. The assessment appendix identifies introductory cell biology as the tested content. Questions concern cells, microscopy, organelles, and distinctions between plant and animal cells. The source describes presentation of science material and participation in Nearpod questions or quizzes. It does not establish the number of sessions, lesson duration, device-sharing arrangement, platform mode, or exact sequence of activities; these details are not reconstructed as facts.

Measures and data collection

Achievement was assessed using a 20-item multiple-choice instrument. Scores were calculated as correct responses divided by 20, multiplied by 100, producing five-point increments. The school's achievement threshold was 80. The appendix labels the instrument for both pretest and posttest, raising the possibility of repeated-item familiarity. Two five-item questionnaires used yes/no responses to describe participation and perceived behavioral changes. Observations and documentation supported contextual descriptions. The source does not report a test blueprint, item analysis, reliability coefficient, or formal validation results. These omissions limit measurement interpretation. The questionnaires are treated as descriptive self-reports, not validated measures of motivation or comprehensive behavioral development.

Reconstruction and analysis

The 42 paired scores were transcribed from thesis Tables 4.1 and 4.2, retaining class and row order as anonymous identifiers. Student-level values took precedence over inconsistent aggregates. Descriptive analyses calculated totals, means, sample standard deviations, medians, ranges, individual gains, and threshold attainment. Group normalized gain was calculated as (posttest mean − pretest mean)/(100 − pretest mean), following the descriptive approach associated with Hake (1998). The mean of individual normalized gains was calculated separately because these quantities need not coincide. Questionnaire percentages used affirmative counts divided by 42. One inconsistent response total was retained and flagged rather than silently corrected.

Exploratory inference and reporting safeguards

The thesis principally compared means. For this article, an additional exploratory paired t-test and a 95% confidence interval described within-student change; Cohen's dz used the mean difference divided by its sample standard deviation (Lakens, 2013). A two-sided Wilcoxon signed-rank test provided a sensitivity analysis for the discrete paired scores. These are secondary calculations, not analyses claimed to have been conducted originally. Their interpretation assumes student-level independence despite possible shared classroom

influences, and cannot establish causation. No unreported ethics approval, consent procedure, funding source, or author contribution is asserted. The analytical table contains anonymous row identifiers only, and questionnaire summaries exclude personal identifiers. Before submission, the authors should verify the reconstructed values against original records and supply missing ethics and implementation information.

Recalculated statistics were rounded to two decimal places for scores and percentages and three decimals for normalized gain. All descriptive calculations retained the original five-point achievement values. No additional students, questionnaire responses, or classroom observations were generated to resolve inconsistencies. The two classes were summarized separately only to show their observed patterns; class membership was not treated as allocation to different experimental conditions or as evidence of treatment moderation.

Results

Data reconciliation and participant coverage

The analytical dataset contained 42 paired observations, corresponding to the two classes listed in the thesis. Each class contributed 21 pretest scores and 21 posttest scores. No missing achievement values appeared in the displayed student-level tables. This completeness concerns the published tables and does not independently confirm attendance or implementation fidelity. Because all eighth-grade students were included, the descriptive results cover the school cohort identified in the source. They do not constitute a random sample of students throughout Sidenreng Rappang Regency. Table 1 summarizes the cohort, design, assessment content, and principal limits of the available research record.

Table 1. Study cohort and available research documentation

Characteristic	Description
Setting	SMP Negeri 2 Kulo, Sidenreng Rappang, Indonesia
Design	One-group pretest-posttest; no comparison group
Research period	June–August 2026, as reported in Chapter IV
Class VIII.1	21 students: 11 girls, 10 boys
Class VIII.2	21 students: 12 girls, 9 boys
Total	42 students: 23 girls, 19 boys
Sampling	Total sampling of the eighth-grade cohort
Assessment	20 multiple-choice items; introductory cell biology
Scale and threshold	0–100; threshold ≥80
Implementation details	Session count, duration, device allocation and delivery mode not established

Note. Source: Jusriani (2026), methods, Chapter IV and assessment appendix. Conflicting semester labels are not resolved by assumption.

Reconstruction identified an important inconsistency in the pretest summary. Adding the individual values yielded 1,885, whereas thesis Table 4.3 reported 1,850. The resulting reconstructed mean was 44.88, compared with the chapter's aggregate mean of 44.05 and the abstract's value of 40. The discrepancy can be traced to the pretest frequencies: the student-level tables contain three scores of 35 and two scores of 70, whereas the aggregate table lists four and one, respectively. Together, these

frequency errors reduce the aggregate total by 35 points. The posttest total of 3,580 was consistent with the individual tables. Table 2 documents this reconciliation.

Table 2. Reconciliation of achievement summaries in the source thesis

Source	Pretest total	Pretest mean	Posttest mean
Thesis abstract	Not given	40.00	85.00
Thesis aggregate Table 4.3	1,850	44.05	85.24
Recalculated Tables 4.1–4.2	1,885	44.88	85.24

Note. The reconstructed pretest frequencies at scores 35 and 70 are 3 and 2; Table 4.3 lists 4 and 1. Student-level values are the basis of this article.

Overall achievement and score distribution

Using the individual scores, the pretest mean was 44.88 with a sample standard deviation of 15.83. The median was 45, and scores ranged from 20 to 75. The posttest mean was 85.24 with a standard deviation of 4.68, a median of 85, and a range of 80 to 95. Thus, the average difference was 40.36 points. Because the assessment contained 20 equally weighted questions, this difference corresponds to approximately eight additional correct answers per student on average. It represents improvement on the available instrument, without independently demonstrating transfer to unfamiliar scientific problems or retention beyond the posttest.

The posttest distribution was concentrated within a relatively narrow interval. Fifteen students scored 80, 12 scored 85, 13 scored 90, and two scored 95. No student scored 100. Pretest scores occupied a much wider interval and included no value meeting the threshold of 80. The smaller posttest standard deviation therefore reflects closer grouping on this assessment. It should not be interpreted as proof that students developed identical conceptual understanding. The five-point score increments and restricted upper range limit the precision with which differences among higher-performing learners can be distinguished. Table 3 presents the overall descriptive statistics and gain measures.

Table 3. Reconstructed overall achievement and exploratory paired analysis

Measure	Pretest	Posttest or gain
Number of scores	42	42
Total score	1,885	3,580
Mean (SD)	44.88 (15.83)	85.24 (4.68)
Median	45.00	85.00
Minimum–maximum	20–75	80–95
Students scoring ≥80	0 (0%)	42 (100%)
Students scoring >80	0 (0%)	27 (64.29%)
Mean paired gain (SD)	—	40.36 (15.12)
95% CI for mean gain	—	35.65–45.07
Individual gain range	—	10–70
Group normalized gain	—	0.732
Mean individual normalized gain	—	0.714
Exploratory paired t-test	—	$t(41) = 17.30$; $p < .001$
Paired Cohen's dz	—	2.67
Wilcoxon sensitivity analysis	—	$W = 0$; $p < .001$

Note. Recalculated from thesis Tables 4.1–4.2. Exploratory inference, confidence interval, effect size and normalized

gains were added for this article. No between-group treatment effect is estimated.

Class patterns and individual improvement

Both intact classes showed higher posttest means. Class VIII.1 increased from 47.86 to 85.95, yielding a mean gain of 38.10 points. Class VIII.2 increased from 41.90 to 84.52, yielding a mean gain of 42.62 points. The second class began with a lower average but finished close to the first class. These values describe within-class patterns rather than an experimental comparison between classes. Both classes received Nearpod-supported instruction, and no allocation to competing conditions occurred. Their results therefore cannot establish that the intervention worked better in one class or that initial differences explain subsequent performance. Table 4 reports the class-specific summaries.

Table 4. Descriptive achievement by intact class

Class	n	Pretest M (SD)	Posttest M (SD)	Mean gain
VIII.1	21	47.86 (18.34)	85.95 (4.90)	38.10
VIII.2	21	41.90 (12.60)	84.52 (4.45)	42.62
Combined	42	44.88 (15.83)	85.24 (4.68)	40.36

Note. Both classes received the intervention. Class summaries are descriptive and do not represent competing experimental conditions.

Every displayed posttest score exceeded the corresponding pretest score. Individual gains ranged from 10 to 70 points, with a mean of 40.36 and a standard deviation of 15.12. The smallest gain occurred among a student who began near the upper end of the pretest distribution, while the largest represented movement from 20 to 90. These observations demonstrate considerable variation in the amount of score change despite universal improvement. The raw gain is bounded by each student's initial score and the test maximum. It is therefore useful to report both absolute improvement and normalized measures, while avoiding claims that either statistic directly measures instructional causality.

Threshold attainment and exploratory statistics

At pretest, zero of 42 students reached the school's threshold of 80. At posttest, all 42 students reached or exceeded it. This represents a rise from 0% to 100% threshold attainment within the cohort. However, 15 students, or 35.71%, scored exactly 80. The universal attainment result is therefore sensitive to the specified cut-off and does not mean that all learners achieved the same margin above it. Twenty-seven students, or 64.29%, exceeded 80, while the remaining 35.71% met it exactly.

The normalized gain calculated from group means was 0.732. Averaging students' individual normalized gains instead produced 0.714. Both describe substantial improvement relative to remaining score space, but they are different calculations and should not be substituted for one another. The exploratory paired t-test yielded $t(41) = 17.30$, $p < .001$. The 95% confidence interval for the mean increase was 35.65–45.07 points, and Cohen's dz was 2.67. A Wilcoxon sensitivity analysis also indicated a systematic positive shift, $W = 0$, $p < .001$. These results describe the strength of the within-cohort contrast under statistical assumptions, not an isolated Nearpod effect.

Student perceptions and response integrity

Participation questionnaire responses were predominantly affirmative. Thirty-seven students reported trying to understand the science material, 40 reported taking the initiative to access activities, and 42 reported asking the

teacher when they did not understand. Thirty-eight reported following instruction from beginning to end. For the activity-completion statement, 37 affirmative and four negative responses were listed, totaling 41 although the declared denominator was 42. The affirmative proportion is therefore reported as 37/42, or 88.10%, with one response unaccounted for in the source. This discrepancy prevents treating the item as a complete binary-response distribution. Table 5 preserves the reported counts and identifies the inconsistency.

Table 5. Participation questionnaire responses

Statement in English translation	Yes	No	Yes %
I try to understand the science material provided through Nearpod.	37	5	88.10
I take the initiative to access and follow each Nearpod activity.	40	2	95.24
I try to complete all learning activities provided through Nearpod.	37	4*	88.10
I ask the teacher when I do not understand science material in Nearpod.	42	0	100.00
I try to follow Nearpod instruction from beginning to end.	38	4	90.48

*Note. Source: thesis Table 4.4. Percentages recalculated with n = 42. *Reported counts total 41 on item 3; one response is unaccounted for. No value was imputed.*

The second questionnaire recorded affirmative counts of 40, 41, 38, 42, and 40 across its five statements. These correspond to 95.24%, 97.62%, 90.48%, 100%, and 95.24%, respectively. Students reported active participation, answering quizzes, confidence to participate, timely completion, and becoming more active. These are favorable post-instruction perceptions. Without baseline questionnaire measures, independent behavioral coding, or a validated scale, they cannot quantify an increase in engagement or demonstrate comprehensive behavioral change. Table 6 summarizes these responses. Overall, the evidence supports improved test performance alongside favorable student reports, while leaving the specific contribution of the platform and the durability of learning unresolved.

Table 6. Self-reported participation and perceived behavioral changes

Statement in English translation
I participate more actively in science learning using Nearpod.
I actively answer quizzes using Nearpod.
Nearpod makes me more confident to participate in science learning.
I can complete multiple-choice questions within the allotted time using Nea
Nearpod helps me become more active.

Note. Source: thesis Table 4.5. Percentages recalculated with n = 42. These are post-instruction self-reports, not baseline-adjusted behavioral changes.

Discussion

The principal finding is a substantial increase in test performance during Nearpod-supported introductory cell-biology instruction. The reconstructed mean rose from 44.88 to 85.24, and all students reached the school's achievement threshold at posttest. These results indicate that the participating cohort performed much better after instruction on the available assessment. They are educationally relevant because the improvement involved the entire displayed cohort rather than a small subset of high performers. At the same time, the design measures the combined consequences of instruction, assessment exposure, teacher support, and the digital environment. It cannot isolate the contribution of Nearpod from these accompanying influences.

A multimedia interpretation is plausible because cell biology requires students to relate structures to functions. Coordinated images and explanations may help learners organize unfamiliar terms into meaningful relationships. Mayer (2017) and Noetel et al. (2022) provide a theoretical and empirical basis for attending to

representation quality. The present study, however, did not compare alternative visual designs or record cognitive processing. Consequently, improved representation is an explanation consistent with the findings, rather than a tested mediator. Future implementation records should identify which diagrams were used, how explanations were sequenced, and whether students could explain functions without relying on identical assessment prompts.

Active responding offers another plausible explanation. The thesis describes students answering questions and quizzes during instruction, and questionnaire responses suggest that many learners experienced the activities as participatory. Freeman et al. (2014) provide broader evidence concerning active learning, although their undergraduate context differs from this school setting. Here, the relevant implication is instructional: participation should require engagement with scientific meaning. A platform can increase the number of submitted answers without necessarily increasing the depth of reasoning. Teachers therefore need questions that distinguish understanding from recognition, such as asking why a plant cell contains structures absent from an animal cell, followed by discussion of the explanation.

Embedded questioning may also support retrieval and formative assessment. Agarwal et al. (2021) offer classroom evidence for retrieval practice, while Black and Wiliam (1998) and Hattie and Timperley (2007) explain why responses and feedback can support learning. These perspectives fit an instructional sequence in which learners attempt an answer and receive clarification. Nevertheless, the thesis lacks sufficient logs to establish feedback timing or quality. Repeated exposure to assessment items may also contribute to the score increase. The present evidence therefore cannot distinguish durable conceptual learning from familiarity with questions. A delayed test using parallel but unfamiliar items would help separate these possibilities.

The results are broadly compatible with Nearpod research across educational contexts. Pramesti et al. (2023) studied elementary materials, and Feri and Zulherman (2021) developed a science e-module. Oktaviani and Nurhamidah (2023) examined language learning, Aryani et al. (2023) addressed mathematics, and Ellianawati et al. (2025) studied scientific literacy and numeracy. Together, these studies justify continued investigation of Nearpod-supported instruction. They do not establish a single expected gain applicable to every classroom. Differences in learner age, content, assessment, and implementation prevent direct numerical comparison. The present contribution is a transparent local account, including correction of inconsistent source aggregates, rather than confirmation of a universal platform effect.

Regional findings concerning other media provide complementary context. Research on Sparkol VideoScribe, Animaker, Smart Apps Creator, and Powtoon has examined science learning in local schools (Sanariya et al., 2023; Nasli et al., 2023; Rahmatullah et al., 2023; Wahyuni et al., 2023). Putri et al. (2026) investigated Genially in junior secondary science. These studies suggest a regional interest in making instruction more interactive and representationally accessible. Their different designs prevent ranking the platforms from reported mean increases. A fair comparison would need matched content, equivalent teaching time, comparable assessments, and a clearly specified alternative condition. Platform selection should therefore consider instructional fit and practical feasibility alongside achievement evidence.

The questionnaire findings add a useful but limited perspective. Students generally endorsed trying to understand the material, accessing activities, participating in quizzes, and asking for clarification. Comparable interests in participation appear in local work on Quizizz, Smart Boards, Canva, Visme, and digital speaking materials (Abdul Jalil Jum'uatullaila et al., 2025; Syamsunir et al., 2026; Nur Hikmah D et al., 2023; Usman M et al., 2026; Hermansyah et al., 2026). Such parallels support examining classroom experience alongside test scores. Yet self-reports may reflect willingness to provide favorable answers, and the missing response discrepancy requires checking. The questionnaires cannot establish that participation increased from its baseline level.

The statistical results require equally careful interpretation. The large paired effect size and small p-values reflect a strong within-student contrast on this test. They do not remedy the absence of a control group or demonstrate generalizability beyond the school cohort. Lakens (2013) supports specifying the effect-size denominator, which matters because paired dz is not equivalent to an independent-groups effect. Hake's (1998) normalized gain likewise summarizes improvement without identifying its cause. In addition, the two classroom settings may introduce shared influences that student-level tests do not capture. The observed gain remains meaningful descriptively, while inferential precision should be treated as exploratory and conditional on its assumptions.

Several limitations shape the practical implications. The record does not establish test reliability, item quality, intervention duration, or a detailed delivery protocol. The posttest's restricted score range limits discrimination among students near the top, while the absence of delayed assessment leaves retention unknown. Teachers can nevertheless use the findings to justify a monitored classroom trial: align representations with objectives, include questions that reveal misconceptions, and review responses before proceeding. Schools should document device access and connectivity rather than assuming equal participation. The relevant lesson is to make implementation observable so that success can be evaluated and adapted to local conditions.

Future research should compare Nearpod-supported instruction with an alternative lesson that has equivalent content and teaching time. Where feasible, allocation across multiple classes would reduce ambiguity about class-level influences. Researchers should retain anonymized item-level data, validate the assessment, record implementation fidelity, and add delayed and transfer tasks. Structured observations could test whether participation actually changes, while interviews could explain difficulties that binary questionnaires conceal. The source records should also be reconciled before journal submission, including the pretest total, research timetable, and incomplete questionnaire item. With these improvements, subsequent work could move from documenting short-term improvement toward estimating when and how Nearpod contributes to science learning.

Conclusion

Nearpod-supported science instruction was associated with substantial short-term improvement among 42 eighth-grade students at SMP Negeri 2 Kulo. Recalculation of the thesis's student-level tables yielded a pretest mean of 44.88 and a posttest mean of 85.24, a gain of 40.36 points. All students improved and reached the school's threshold of 80 at posttest. Questionnaire responses were generally

favorable, suggesting that learners perceived the activities as supportive of participation. These findings concern achievement on an introductory cell-biology instrument and student perceptions within the participating cohort.

The results support considering Nearpod as a practical instructional option under monitored classroom conditions. They do not establish that Nearpod alone caused the improvement or outperformed another teaching approach. The absence of a comparison group, incomplete intervention documentation, unreported measurement validation, and source inconsistencies constrain interpretation. Before submission, the authors should verify the reconstructed data and complete the missing methodological and ethics information. Controlled research with validated parallel assessments, implementation records, and delayed testing is needed to determine the contribution and durability of Nearpod-supported science learning.

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