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The Effectiveness of a Canva-Based Educational Game on Students' IPAS Learning Outcomes in Elementary Schools

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Abstract: This study aims to develop a Canva-based educational game entitled "How Breathing Helps Me in Daily Activities" as an innovative learning medium for Ilmu Pengetahuan Alam dan Sosial (IPAS) in elementary schools. The research employed a Research and Development (R&D) approach consisting of four stages: analysis, design, development, and limited trials. The product was developed using the Canva platform and incorporates interactive game elements to support students' engagement with the topic of the human respiratory system. Validation was conducted by material, media, and language experts, while practicality was examined through individual and small-group trials involving students. Learning improvement was analyzed using a one-group pretest–posttest design. The validation results indicated that the developed educational game achieved a very valid category in terms of content accuracy, media design, and language clarity. Practicality testing yielded a score above 90%, indicating that the media is easy to use, engaging, and appropriate for the cognitive characteristics of elementary school students. The analysis of learning outcomes showed an increase in students' average scores from 50,40 in the pretest to 87,13 in the posttest, with an N-gain value of 0.74 categorized as high. These findings suggest that the developed game supports students' understanding of the human respiratory system and its relationship to daily activities. Overall, this study contributes empirical evidence that a Canva-based educational game on the theme "How Breathing Helps Me in Daily Activities" is valid, practical, and demonstrates promising learning outcomes for IPAS instruction at the elementary level. Further studies using experimental designs with control groups are recommended to strengthen evidence of its effectiveness and generalizability.

Keywords: Educational game; Canva; Elementary school learning; Froggie educoplay; IPAS

Introduction

Elementary education represents a crucial formative phase in developing students' foundational knowledge, skills, and attitudes. At this stage, children are not only expected to master factual knowledge but also to cultivate higher-order thinking skills such as critical thinking and problem-solving. Literature evidence suggests that inquiry-based or inquiry-oriented approaches effectively guide students through stages of scientific thinking that build such abilities (Pedaste et al., 2015; Alarcon et al., 2023). Furthermore, project-based (PBL) or problem-based learning—often integrated with science and social dimensions—has been proven to enhance 21st-century skills including critical thinking, collaboration, and problem-solving among elementary learners (Rehman et al., 2023).

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In the Indonesian educational context, the development of IPAS (Integrated Natural and Social Science) learning that leverages technology and integrated approaches faces specific challenges but also offers opportunities to strengthen student engagement and socio-cognitive skills aligned with the goals of the national curriculum (Rasimin et al., 2024). However, many technology-based IPAS implementations remain limited to presentation-oriented media and have not yet optimally integrated inquiry processes, game mechanics, and real-life problem contexts into a single cohesive learning experience. Therefore, reinforcing IPAS learning through inquiry, PBL, and technology integration is a relevant step toward developing both factual understanding and higher-order thinking abilities in elementary education.

IPAS learning at the elementary level is designed to help students understand natural and social phenomena around them, connect scientific concepts to everyday life, and develop scientific attitudes rooted in curiosity, openness, and reasoning ability. One of the key topics in Grade IV IPAS is the human respiratory system, particularly under the theme "How Breathing Helps Me in Daily Activities". This topic emphasizes students' understanding of respiratory organs, air movement mechanisms, and their relationship with daily activities such as walking, running, studying, and playing. Research indicates that children often hold misconceptions about body organs and functions, as seen in their drawings or annotations; thus, teaching strategies are needed to guide them toward more accurate mechanistic understanding (Andersson et al., 2020).

Activities involving modeling and analogies within inquiry-oriented learning have proven effective: studies with lower–middle grade students found that modeling activities (e.g., syringe/balloon analogies) help students construct explanatory models of how air moves and lungs change volume, thus connecting organs, functions, and activities (Han & Kim, 2019).

On the other hand, the use of interactive media and technology such as educational games can strengthen visualization of respiratory structures and processes, enhance engagement, and help explain the relationship between breathing and physical activities consistent with research on AR affordances in science learning (Cheng & Tsai, 2013). Moreover, project-based learning (PJBL) that links real-world problems enables students to relate scientific concepts to everyday experiences and develop 21st-century skills such as collaboration and communication (Markula & Aksela, 2022). Despite these advantages, few studies have explicitly combined game-based learning, inquiry-oriented tasks, and IPAS content focusing on the functional relationship between respiration and daily activities at the elementary level, particularly using easily accessible platforms such as Canva.

However, in practice, IPAS learning—especially the human respiratory system—is still predominantly teacher-centered, relying on lectures and textbooks without interactive media. As a result, students tend to be passive, struggle to connect concepts with real-life contexts, and show suboptimal learning outcomes. With the advancement of digital technology, new opportunities for innovative learning media have emerged—one of which is through Canva, an interactive design platform. Originally known as a graphic design tool, Canva can now be developed into visual learning media or even educational games that are engaging and contextually relevant. This potential is particularly valuable for teaching abstract concepts like respiration, which can be visualized through illustrations, animations, and challenge-based activities. Through game-based learning, students not only view respiratory organs but also interact through quizzes, puzzles, or missions related to daily life (e.g., "Why do we pant after running?" or "How does the air we inhale help our body stay energized?"). Local studies support this direction is Dewi & Setyasto (2024) found that interactive media such as Canva improved conceptual understanding of the respiratory system compared to conventional methods, while Fikriyyani et al. (2024) reported that Canva-based media increased student motivation and participation.

Nevertheless, most previous studies focused primarily on motivation or general learning outcomes, without deeply examining learning gains through quantitative effectiveness measures or explicitly targeting critical thinking skills related to real-life physiological phenomena. This gap highlights the need for empirical studies that not only develop Canva-based media but also rigorously test its effectiveness and cognitive impact.

Game-based learning has been widely studied and shown to enhance motivation, engagement, and learning outcomes (Alika & Radia, 2021; Yusup et al., 2025), as its playful elements promote active, collaborative learning and a sense of achievement (Faaiqoh & Ratnaningrum, 2024). Integrating Canva in educational game development offers novelty because it is both accessible and flexible, enabling teachers and students to present IPAS materials—especially the respiratory system—in an interactive, enjoyable visual format. The novelty of this study lies in the development and empirical testing of a Canva-based educational game that integrates inquiry-oriented tasks, daily-life problem scenarios, and IPAS content into a single learning medium specifically designed for Grade IV elementary students. Unlike prior studies, this research emphasizes the functional linkage between respiratory

processes and students' everyday activities while simultaneously targeting conceptual understanding and critical thinking skills.

The effectiveness of any learning media must be empirically verified. In this study, effectiveness is measured by the extent to which the Canva-based educational game enhances students' understanding of the human respiratory system. Understanding is assessed through pre-test and post-test instruments, analyzed using N-gain to evaluate improvement and t-tests to determine statistical significance. Thus, the developed media is expected not only to be visually engaging but also to produce measurable learning gains. Supporting evidence includes Ma'rufah & Andaryani (2025) who found significant learning gains in respiratory system material using AR-based interactive media, and Arifin et al. (2024) who demonstrated that applying Gagné's learning theory led to significantly higher N_{gain} and t-test results in science learning compared to control groups. Similarly, Khofifatunzahrah et al. (2024) reported medium N_{gain} scores and significant pretest-posttest differences in science topics, confirming learning improvements.

In addition to learning outcomes, this study also focuses on developing critical thinking skills. Within the respiratory system topic, critical thinking allows students to analyze the relationship between organs and physical activity, evaluate causes of breathing disorders, and propose simple solutions for maintaining lung health. Unfortunately, many students still tend to memorize organ names without connecting them to real-life contexts—highlighting the need for more practical and interactive strategies. Aulia et al. (2023) showed that active learning approaches enhanced students' scientific process skills and conceptual understanding of respiration. Fauni & Isdaryanti (2025) further demonstrated that interactive media facilitated visualization of respiratory structures and processes, linking them to students' daily experiences. Moreover, Nisyaa et al. (2025) confirmed that Canva is a feasible platform for designing interactive and engaging learning materials, forming a strong technical basis for developing Canva-based educational games that foster problem-solving and critical thinking in respiratory system learning.

Therefore, this research is important to conduct because it responds directly to existing pedagogical gaps: the need for accessible, technology-based learning media that integrate inquiry, game-based learning, and real-life contexts within IPAS instruction. By empirically evaluating both learning outcomes and critical thinking skills, this study provides evidence-based guidance for teachers and curriculum developers seeking effective strategies to improve science learning quality in elementary schools.

Based on the above discussion, this study is significant in empirically testing the effectiveness of Canva-based educational games in improving elementary students' understanding of the human respiratory system and its connection to daily activities. The findings are expected to make a meaningful contribution to the development of innovative, technology-based learning strategies, enrich the literature on game-based learning in Indonesia, and serve as practical recommendations for teachers integrating digital interactive media into IPAS instruction.

Method

This study employs a Research and Development (R&D) approach aimed at developing and testing the effectiveness of a Canva-based educational game as a learning medium to enhance elementary students' understanding of the human respiratory system and its relevance to daily activities, while simultaneously fostering their critical thinking skills. The development model adopted is Rowntree's model, which consists of three main stages: Planning, Development, and Evaluation.

The choice of this model aligns with the findings of Melinia et al. (2024), who successfully developed an ethnoscience-based Physics Module integrating local wisdom from the Rumah Limas Palembang culture using the Rowntree model, resulting in a significant improvement in students' cognitive abilities. Similarly, Nurmahasih & Wiyono (2024), demonstrated that the development of an Environmental Context-Based Static Fluid Learning Video using R&D procedures produced a valid, practical, and effective medium for improving students' physics learning outcomes. These studies reinforce that the systematic steps of the Rowntree model can be flexibly applied across various science domains, including the development of Canva-based educational games for the respiratory system topic.

Research Setting, Time, Subjects, and Objects

This study was conducted at Sekolah Dasar Negeri Sri Damai, located in Keluang District, Musi Banyuasin Regency. The research took place over six months, from January to July 2025, during the even semester of the 2024/2025 academic year. The research subjects were 13 fifth-grade students, consisting of 8 females and 5 males. The object of this study focused on the development and implementation of a Canva-assisted educational game designed for IPAS (Integrated Natural and Social Science) learning, with the purpose of examining its effectiveness in facilitating the learning process.

Research Procedure

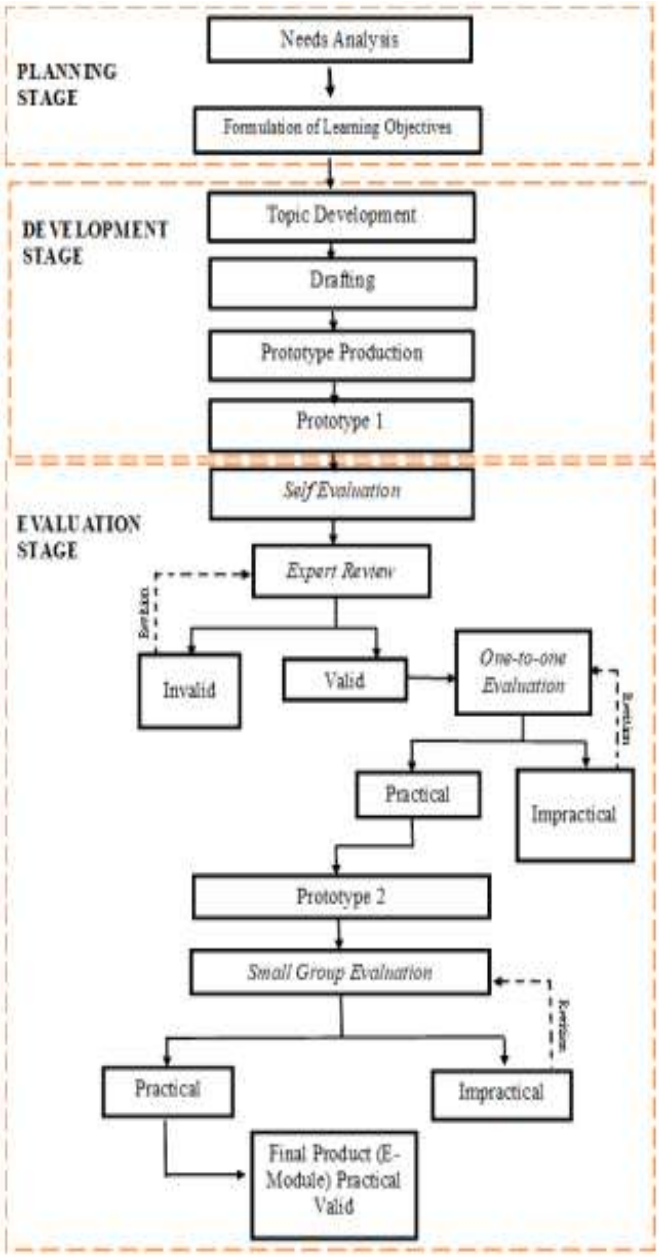

Figure 1. Research flow (Modification by Sari & Wiyono (2025))

Planning Stage

At this stage, the researcher conducts a needs analysis through classroom observations of IPAS (Integrated Science) learning in grade IV of elementary school, interviews with teachers, and curriculum reviews to ensure that the developed media aligns with the learning objectives of the human respiratory system topic. The analysis focuses on students' difficulties in understanding the functions of respiratory organs, their relation to daily activities, and their low critical thinking skills in analyzing simple phenomena such as breathing during exercise. In addition, the characteristics of fourth-grade students—who are at the concrete operational stage—are identified, so the developed product must be contextual, visual, and interactive to ensure easy comprehension.

Development Stage

In this stage, the researcher designs a Canva-based educational game storyboard that outlines the IPAS learning flow on the human respiratory system, with the theme "How Breathing Helps Me in Daily Activities." The implementation of the design into an interactive digital format includes the selection of colors, illustrations of respiratory organs, simple animations of breathing mechanisms, and game elements such as points, challenges, interactive quizzes, and critical thinking prompts. Evaluation instruments are also prepared in the form of pre-test and post-test questions, observation sheets, and teacher and student response questionnaires. The developed product is then tested through a one-to-one test to assess comprehensibility, a small-group test to evaluate practicality, and a large-group test (class trial) to measure the effectiveness of the media on a broader scale.

Evaluation Stage

Evaluation is carried out in two forms: formative and summative. Formative evaluation is conducted at each trial stage (individual, small group, and large group) to obtain feedback for improving the media. Summative evaluation is conducted to assess effectiveness through pre-test and post-test methods on the respiratory system topic. The test results are analyzed to determine the improvement in students' understanding using the N-gain formula and categorized as high, medium, or low. Furthermore, a t-test is performed to determine the significance of the difference between pre-test and post-test scores. This analysis also includes students' critical thinking skills, which are assessed based on indicators of analyzing, evaluating, and drawing conclusions from daily-life phenomena related to the respiratory system.

Data Collection Techniques

This study employs several data collection techniques for both qualitative and quantitative data types. The techniques used include observation, interviews, questionnaires, and tests. Each technique serves specific stages of the research: observation and interviews are used as data sources during the needs analysis process; questionnaires are used in several stages such as needs analysis, expert validation, and practicality testing; and tests are used to examine the effectiveness of the developed product.

Data Analysis

Data processing is conducted according to the data type. Observation and interview data are processed and presented descriptively to support the quantitative data obtained from questionnaires. Meanwhile, most of the questionnaire data are analyzed using a Likert scale with the following formula.

Table 1. Likert scale rating level

Expert Response	Score
Very Good	5
Good	4
Enough/Neutral	3
Poor	2
Very Poor	1

Data from the validation sheets filled out by the experts can be averaged using the following formula.

$$X = \frac{\text{Obtained Score}}{\text{Ideal Maximum Score}} \times 100\% \quad (1)$$

The result would be categorized by following criteria.

Table 2. Assessment criteria

Range (%)	Agreement Category	Validity Category	Practicality Category
0–20	Strongly Disagree	Very Invalid	Very Impractical
21–40	Disagree	Invalid	Impractical
41–60	Neutral	Fairly Valid	Fairly Practical
61–80	Agree	Valid	Practical
81–100	Strongly Agree	Very Valid	Very Practical

However, for the test would be find the N-gain Score with this formula.

$$N_{gain} = \frac{S_{posttest} - S_{pretest}}{S_{maximum} - S_{pretest}} \quad (2)$$

Description:
N_{gain} = Normalized N_{gain} Score
Score pre-test = Average score before treatment
Score post-test = Average score after treatment Score Maximum = Score Maximum

The level of N_{gain} can be classified as follows.

Table 3. N_{gain} Score Criteria

N_{gain} Score	Category
> 0.7	High
> 0.3 < 0.7	Mid
< 0.3	Low

In addition to learning outcomes, data on students' critical thinking skills were analyzed using an assessment rubric based on critical thinking indicators (providing simple explanations, building basic skills, drawing conclusions, providing further explanations, and organizing strategies and tactics). The assessment results were analyzed using a descriptive quantitative approach, and their effectiveness was tested using the same methods, namely the N-gain and t-test.

Result and Discussion

The final product produced is a Canva-based educational game featuring a learning sequence on the human respiratory system. The game presents a storyline that begins with the introduction of respiratory organs, continues with the mechanisms of inspiration and expiration, and concludes with the connection between breathing and daily activities such as running, speaking, and playing.

The media display is designed to be visually engaging, incorporating bright color combinations, illustrations of respiratory organs, and simple animations. The types of activities include interactive quizzes, puzzles, problem-based questions, and point-based challenges to enhance student motivation. Interactive features include navigation buttons, direct response fields, and visual-based tasks that facilitate concept comprehension. The following are several images of the final product.

Figure 2. Cover

Figure 3. Main menu

Figure 4. Material session

Figure 5. Game session

The final product represents a version that has been refined through a self-evaluation process. Based on the series of development stages that have been carried out, the researcher concludes that each phase was systematically and meticulously designed to ensure the final product is both effective and user-friendly. This self-evaluation demonstrates that the researcher successfully integrated various elements into a cohesive whole.

During the design phase, the decision to use a non-distracting color palette and large, clear fonts was a strategic choice based on the researcher's understanding of elementary school students' characteristics, in which visual comfort and readability are crucial factors in creating a pleasant and engaging learning experience. Furthermore, the process of developing visual assets was conducted efficiently and creatively. By utilizing existing assets available in Canva, the researcher was able to save time and resources while still producing visually appealing materials relevant to the theme of the heart and lungs. This demonstrates that the product can be developed effectively without building every component from scratch, while the custom-made illustrations successfully visualize complex concepts in a simple and easy-to-understand manner.

The game's structure, which is divided into several "rooms"—including learning objectives, usage instructions, materials, and evaluation—represents a holistic approach that ensures the game serves not merely as entertainment but as a comprehensive learning medium. The decision to integrate Froggie Educoplay with Canva is an innovative step that allows for the creation of a strong interactive learning package. Students first engage with instructional videos to absorb the material, and then test their understanding through the game and evaluation activities. This creates a logical and continuous learning flow, where each component reinforces the others to enhance knowledge retention.

Overall, the development process reflects the researcher's strong commitment to producing a learning medium that is not only technically innovative but also grounded in solid pedagogical principles. It is believed that this product can make a significant positive impact on students' learning outcomes. To strengthen the evaluation results, this prototype will subsequently undergo expert validation testing.

Expert Validation

The researcher collaborates with a team of validators consisting of a media expert, a material expert, and a language expert to identify, assess, and evaluate the Canva-Assisted Educational Game for Elementary School IPAS Subjects. The following are the results of the experts' evaluation.

Table 4. Expert validation result

Validator Type	Mean Score	Maximum Score	Validity Percentage (%)	Category
Media Expert	4.67	5.00	94.15	Very Valid
Material Expert	4.40	5.00	84.66	Very Valid
Language Expert	4.30	5.00	88.75	Very Valid

Based on the expert validation results presented in Table 4, the Canva-assisted educational game developed for IPAS learning at the elementary level demonstrated a very high level of validity across all evaluated aspects. Validation was conducted by three experts — media, material, and language experts — to ensure that the product met pedagogical, technical, and linguistic standards.

The media expert evaluation yielded a mean score of 4.67 out of 5.00, corresponding to a validity percentage of 94.15%, which falls into the Very Valid category. This result indicates that the learning media has an excellent visual design, clear layout structure, effective navigation, and high interactivity. The media expert's assessment confirms that the Canva-based educational game is technically well-designed and user-friendly for elementary school students, supporting active engagement and ease of use during the learning process.

The material expert provided a mean score of 4.40, with a validity percentage of 84.66%, also classified as

Very Valid. This finding suggests that the instructional content is accurate, relevant, and aligned with the IPAS curriculum for Grade IV. The material expert's validation indicates that the concepts related to the human respiratory system are presented coherently and systematically, facilitating students' understanding of the relationship between respiratory processes and daily activities. Although slightly lower than the media and language aspects, this score still reflects strong content validity and instructional suitability.

Meanwhile, the language expert evaluation resulted in a mean score of 4.30 and a validity percentage of 88.75%, categorized as Very Valid. This outcome demonstrates that the language used in the educational game is clear, age-appropriate, and easily understood by elementary school learners. The expert confirmed that sentence structures, terminology, and instructions are suitable for students' cognitive and linguistic development, thereby minimizing potential misinterpretations during learning activities.

Overall, the consistently high validity percentages across all expert evaluations indicate that the Canva-assisted educational game meets the required standards in terms of media quality, content accuracy, and language clarity. Therefore, the product is considered feasible and appropriate for implementation in IPAS learning at the elementary school level, with no major revisions required prior to field testing or effectiveness evaluation.

Practicality Test

The practicality test is a testing stage aimed at evaluating the ease of use and functionality of the product from the perspective of actual users. This stage ensures that the product not only functions well technically but is also easy to understand, accessible, and relevant to its target users—elementary school students. The practicality testing phase was carried out through two main schemes: the one-to-one test and the small-group test.

Table 5. One to one test result

Name	Content Suitability	Visual Appearance	Interactivity	Language	Total Score	Ideal Total Score	Practicality Score (%)
P	14	19	15	15	63	65	96
DAS	14	8	14	14	60	65	92
EMP	14	8	13	14	59	65	90
Average							92

Table 6. Small group test result

Name	Content Suitability	Visual Appearance	Interactivity	Language	Total Score	Ideal Total Score	Practicality Score (%)
WC	14	18	14	14	60	65	92
DSN	15	18	14	14	61	65	93
SDF	15	20	13	15	63	65	96
ZNA	14	20	14	15	63	65	96
MAMH	15	20	13	15	63	65	96
Average							94.6

The individual practicality test of the educational game "How Breathing Helps Me Carry Out Daily Activities" showed Highly Practical results, with scores above 90% from three students (P = 96%, DAS = 92%, EMP = 90%). The students rated the game as interesting, easy to understand, and enjoyable to use. Their comments included: "*The game is very interesting; it makes it easier for me to understand the material*" (P), "*The video is fun, and the game is great because it has animations*" (DAS), and "*The material is easy to understand, the sound is clear, and the game is engaging*" (EMP). These findings confirm that the game aligns well with the characteristics of elementary school students, is easily accessible, and effectively supports IPAS learning.

The small group test of the educational game "How Breathing Helps Me Carry Out Daily Activities" once again showed Highly Practical results, with high average scores ranging from 92 to 96% from five students (WC, DSN, SDF, ZNA, MAMH). This assessment confirms that the game is easy to use, visually appealing, interactive, and effective in presenting the material. The students' comments also support these findings, for example: "*The game is very interesting, and the animations are great*" (WC), "*Interesting and not boring*" (DSN), "*Good and easy to use, it helps me understand easily*" (SDF), "*Very fun and not confusing*" (ZNA), and "*The game is very good, easy to use, the material is easy to understand, and the sound is clear*" (MAMH).

Overall, this small group test reinforces the results of the individual test, proving that the educational game is practical, enjoyable, and effective in supporting IPAS learning in elementary schools. After being declared practical, the product will be tested with all students who are the subjects of the research to evaluate its effectiveness.

Effectiveness Test

The effectiveness testing was conducted using a one-group pretest–posttest design to examine changes in students' learning outcomes after using the Canva-based educational game. This test was conducted through a field test, in which the educational video was implemented with a larger group of students in a real classroom learning situation. During the implementation, the researcher employed the pre-test and post-test method.

Based on the pre-test results, no students achieved scores in the Very Good (81–100) or Good (61–80) categories. Most students, totaling 12 individuals (80%), were in the Fair category (41–60). This indicates that the majority of students already possessed some initial understanding of the material, but their comprehension was still limited and had not yet reached a satisfactory mastery level. In addition, 3 students (20%) obtained scores in the Poor category (21–40), suggesting that there were still students with low initial understanding of the tested material. No students were classified in the Very Poor category (0–20).

Table 7. Student pretest result

Interval Score	Student	Percentage (%)	Category
81-100	0	0	Very Good
61-80	0	0	Good
41-60	12	80	Enough
21-40	3	20	Poor
0-20	0	0	Very Poor

Overall, these pre-test results indicate that the students' initial ability regarding the material ranged from relatively low to moderate. With most students in the Fair category, further learning was deemed necessary to improve their understanding to the Good or Very Good levels after being given treatment through the use of educational media/game-based learning.

Following the administration of the pre-test, the testing process continued with the learning phase, during which students received special treatment in the form of IPAS learning on the topic "How Breathing Helps My Daily Activities" using a Canva-based educational game. After the learning process was completed, the researcher administered a post-test to measure students' understanding after using the product.

Table 8. Student posttest result

Interval Score	Student	Percentage (%)	Category
81-100	12	80	Very Good
61-80	3	20	Good
41-60	0	0	Enough
21-40	0	0	Poor
0-20	0	0	Very Poor

The post-test results showed a significant improvement compared to the pre-test. Most of the students, 12 individuals (80%), successfully achieved the Very Good category (81–100). In addition, 3 students (20%) were in the Good category (61–80). No students obtained scores in the Fair, Poor, or Very Poor categories.

These findings indicate that after participating in the learning process using the educational game "How Breathing Helps Me Carry Out Daily Activities", nearly all students achieved an optimal level of material mastery. The dominance of scores in the Very Good category demonstrates that the learning media used was effective in improving students' understanding of the material.

Based on the difference between the pre-test and post-test results, the N-Gain score was calculated, and the following results were obtained.

Table 9. Comparison pretest and posttest

Name	Pretest	Posttest	N-Gain	Category
AS	60	86	0.65	Mid
AZA	60	86	0.65	Mid
BKP	53	86	0.70	High
CZM	53	93	0.85	High
EH	60	93	0.83	High
HO	40	86	0.77	High
JM	46	86	0.74	High
KAI	53	100	1.00	High
KAY	60	80	0.50	Mid
LHA	53	80	0.57	Mid
LP	46	80	0.63	Mid
MAD	40	86	0.77	High
SDC	40	86	0.77	High
SP	46	86	0.74	High
YI	46	93	0.87	High
Total	756	1307		
Average	50.4	87.13	0.74	High
Minimum	40	80		
Maximum	60	100		

Based on the comparative data presented in Table 11, there was a significant improvement in students' understanding after the use of the learning media. The analysis began by examining the students' initial condition through the pre-test, where the average class score was only 50.4, indicating a relatively low level of knowledge and a considerable gap in understanding. This condition emphasized the need for an effective learning media intervention.

After the implementation of the educational video, a drastic increase was observed in the post-test results, with the average class score rising to 87.13. This improvement was particularly striking as the minimum score reached 80 and the maximum 100, indicating that

the learning media successfully enhanced students' comprehension uniformly across the class.

To measure this improvement more objectively, an N-Gain analysis was conducted. The average N_{gain} value of the class was 0.74, which falls into the "High" category, proving that the learning media had a highly substantial effect. Individually, the majority of students (10 out of 15) also achieved the "High" category, while the remaining students were in the "Moderate" category, with none in the "Low" category.

These results indicate a substantial increase in students' learning scores following the use of the Canva-based educational game. However, the findings represent learning gains observed within the research group and do not establish causal effectiveness due to the absence of a control group.

Discussion

The research findings presented in the previous sections demonstrate that the development of a Canva-based educational game with the theme "How Breathing Helps Me in Carrying Out Daily Activities" was associated with positive changes in both the learning process and students' learning outcomes. This impact can be analyzed from several perspectives, including media feasibility, practicality, learning outcomes, and its theoretical and empirical relevance to learning theories and previous studies.

First, in terms of media feasibility, the validation results involving three experts—material experts, media design experts, and language experts—consistently show that the product falls under the "Highly Valid" category. This indicates that the educational game is feasible not only in terms of content but also in terms of presentation, language, and visual appearance. According to Piaget's constructivist theory (Zakiyah & Rahmawati, 2023), effective learning experiences must be designed with consideration of students' cognitive characteristics. In this research, the use of bright colors, large fonts, communicative language, and simple animations aligns well with the concrete operational stage of elementary school students, who require visual stimuli and concrete learning experiences to understand abstract concepts such as the mechanism of breathing.

Furthermore, studies on the development of animated video and interactive multimedia learning media have shown that attractive visual elements (e.g., bright colors, illustrations/cartoons, simple animations) and readable interfaces contribute to increased motivation, engagement, and conceptual understanding. When combined with expert validation (content, media, and language), such products are considered both feasible and effective before being tested more broadly (Purwantara & Wiryanto, 2024).

Second, regarding practicality, the results of both individual and small group trials indicate that students found the game highly practical to use. Positive evaluations of the game's visual design, interactivity, and language demonstrate that the product successfully meets the principle of user-friendliness. This finding aligns with the research by Shabrina et al. (2025) "The Importance of Selecting Appropriate Learning Media to Improve Students' Learning Outcomes." Students' feedback revealed that the material was easier to understand, the game was enjoyable, and the navigation was easy to follow. The high level of practicality also suggests that the media does not increase students' cognitive load; instead, it helps them focus more effectively on the learning content.

Third, from the perspective of learning outcomes, the study shows a notable improvement from the pre-test to the post-test. The students' average score increased from 50.4 (pre-test) to 87.13 (post-test). The N_{gain} value of 0.74, categorized as "High", indicates substantial learning gains following the learning intervention. According to Ausubel's meaningful learning theory, learning becomes more effective when students can connect new information with their existing knowledge. In this study, the game provided a sequential learning structure—from the introduction of organs and the mechanisms of inspiration and expiration to their connection with daily activities. This flow helped students build logical relationships between new concepts and their real-life experiences, such as running or speaking. Thus, the game not only conveyed knowledge but also facilitated deeper conceptual understanding.

Therefore, it can be concluded that there was a significant improvement in students' learning outcomes after the treatment, with an average increase of more than 36 points. However, given the use of a single-group pretest–posttest design, this improvement should be interpreted as evidence of learning gains rather than definitive causal effectiveness.

Additionally, this improvement can be explained using Keller's ARCS motivational model, which emphasizes four aspects: Attention, Relevance, Confidence, and Satisfaction (Asiani et al., 2017). The educational game successfully captured students' attention through its engaging visuals and simple animations; maintained relevance by connecting the breathing topic to daily activities; enhanced confidence through point and feedback systems; and created satisfaction by allowing students to successfully complete in-game challenges. Thus, the game not only delivered content but also motivated students to engage actively in learning.

The game's success in capturing students' interest reflected in their comments such as "very interesting"

and "not boring" illustrates the principles of effective gamification. Rather than feeling forced to learn, students were intrinsically motivated because the game met their fundamental needs for enjoyment and challenge. The game transformed passive learning content into an active and meaningful learning experience.

In relation to previous studies, these findings are consistent with research showing that game-based learning media effectively improve students' learning outcomes. For example, Suryani et al. (2022) found that educational games can enhance students' motivation and concentration. Similarly, Safa'at et al. (2024) confirmed that Canva-based interactive media facilitates conceptual understanding through appealing visuals and ease of use. Moreover, Kusumawati & Prastiwi (2025) demonstrated that the development of Canva-based media for IPAS subjects on metamorphosis topics improved engagement and understanding among elementary students. These findings are also consistent with Khodijah & Ismiyanti (2025) who stated that game-based learning using interactive digital media can enhance students' critical thinking skills in IPAS learning. Thus, this study not only reinforces previous findings but also contributes new insights by integrating Canva with Froggie Educoplay as an innovative approach to IPAS learning in elementary schools. Thus, this study reinforces and extends previous research by presenting empirical evidence from the development and implementation of a Canva-based educational game entitled "How Breathing Helps Me in Carrying Out Daily Activities" for elementary IPAS learning.

Furthermore, the success of this study can also be viewed from the perspective of modern pedagogical approaches, such as Kolb's experiential learning theory. The developed educational game allows students to learn through direct experience, where they not only read or listen to explanations but also actively participate through quizzes, challenges, and animated visualizations. This aligns with Kolb's experiential learning cycle, which emphasizes four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. The game successfully facilitates all four stages, thereby enriching students' overall learning experience.

In conclusion, the development of this Canva-based educational game meets the criteria of validity and practicality and demonstrates promising learning outcomes as an IPAS learning medium. Its success stems from the integration of instructional design principles, learning theories, and educational technology innovation. This research provides empirical evidence that educational games can serve as a relevant and effective learning medium in the digital era, while also reinforcing the findings of previous studies. Moreover, this study opens opportunities for further development—such as integrating collaborative or adaptive learning features—to better accommodate the diverse needs of students.

Conclusion

This study developed a Canva-based educational game entitled "How Breathing Helps Me in Daily Activities" for IPAS learning in elementary schools. The product was designed using the Canva platform and incorporates interactive game elements and characters to support students' engagement with the topic of the human respiratory system. Expert validation results from material, media, and language specialists indicated that the product achieved a very valid category, confirming its appropriateness in terms of content accuracy, media design, and linguistic clarity. In addition, the practicality test showed a score above 90%, suggesting that the media is easy to use and suitable for the characteristics of elementary school students. The learning outcomes analysis revealed an improvement in students' understanding, as indicated by an increase in the average score from 50.4 (pretest) to 87.13 (posttest), with an N_{gain} value of 0.74 categorized as high. These results indicate that the developed media has the potential to support learning improvement; however, given the use of a single-group pretest–posttest design without a control group, the findings should be interpreted as evidence of learning gains rather than definitive proof of causal effectiveness. The observed improvement is consistent with Constructivist Learning Theory and Keller's ARCS Motivation Model, which emphasize the role of interactive and game-based media in facilitating concrete learning experiences and enhancing student motivation. The main contribution of this research lies in providing empirical evidence that a Canva-based educational game on the theme "How Breathing Helps Me in Daily Activities" is valid, practical, and shows promising learning outcomes for IPAS instruction at the elementary level. Nevertheless, this study is limited by the scope of the material and the sample size. Therefore, further research employing experimental or quasi-experimental designs with control groups and broader subject matter is recommended to more robustly examine the effectiveness and generalizability of the developed media.

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