JPPIPA 11(12) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Canva-Based Interactive Educational Comic Media for Science and Social Studies Learning in Elementary Schools

Rinadevi[1*], Abna Hidayati[1], Yalvema Miaz[1], Elfia Sukma[1]

[1] Department of Primary Education, Faculty of Education, Universitas Negeri Padang, Padang, Indonesia.

Received: October 28, 2025
Revised: November 29, 2025
Accepted: December 29, 2025
Published: December 31, 2025

Corresponding Author:
Rinadevi
rinadevi991@gmail.com

DOI: 10.29303/jppipa.v11i12.13274

Abstract: The integration of technology into elementary education is essential for creating engaging and meaningful learning experiences. This study aims to develop an interactive educational comic based on Canva as an innovative learning medium to enhance students' motivation and learning outcomes in Natural and Social Sciences (IPAS). The objective is to produce a learning medium that is valid, practical, and effective for use in elementary schools. This research adopts a Research and Development approach using the 4D model comprising Define, Design, Develop, and Disseminate stages. Data were collected through expert validation questionnaires, classroom observations, and learning achievement tests, and analyzed using descriptive quantitative techniques to determine the validity, practicality, and effectiveness of the product. The results show that the Canva-based educational comic obtained a validity score of 98.2 percent indicating a highly valid category, a practicality score of 94.7 percent indicating a highly practical category, and an N-Gain score of 0.74 indicating high effectiveness in improving learning outcomes. These findings demonstrate that the developed media can significantly enhance students' conceptual understanding and learning engagement in IPAS. In conclusion, the Canva-based interactive comic is a feasible and beneficial learning medium for elementary education and contributes to the development of digital learning resources that align with the Merdeka Curriculum. Future research is recommended to apply this media across different grade levels and subjects while integrating more dynamic interactive features to enrich the learning experience.

Keywords: Canva-Based Learning Media; Educational Comics; Innovative Pedagogy; Interactive Learning; Natural and Social Sciences (IPAS).

Introduction

Education plays a central role in developing high-quality, knowledgeable, and character-oriented human resources. The integration of education into human resource development, such as curriculum alignment with industry needs and competency-based training, has been proven to enhance workforce quality and competitiveness while bridging the skills gap in the labor market (Alam & Dewi, 2024; Rofik et al., 2025). Education also plays a vital role in fostering both technical and non-technical skills, including leadership, teamwork, and problem-solving, which are highly required in the era of globalization and digitalization (Alam & Dewi, 2024; Rofik et al., 2025; Taufiqurrahman, 2024).

In the 21st century, education is required to integrate technology effectively into the learning

How to Cite:
Rinadevi, Hidayati, A., Miaz, Y., & Sukma, E. (2025). Development of Canva-Based Interactive Educational Comic Media for Science and Social Studies Learning in Elementary Schools. *Jurnal Penelitian Pendidikan IPA*, *11*(12), 409–416. https://doi.org/10.29303/jppipa.v11i12.13274

process. Educators are expected not only to serve as transmitters of knowledge but also as facilitators who can create creative, innovative, and interactive learning environments. The use of technology-based learning media has become a strategic approach to create meaningful learning experiences and stimulate students' interest. Effective learning media not only support efficient content delivery but also help students grasp abstract concepts in more concrete and visual ways. Research has shown that technology-based media enhance student engagement, motivation, and conceptual understanding, transforming abstract knowledge into concrete and comprehensible forms (Akram et al., 2022; Consoli et al., 2024). The quality of technology integration, rather than its frequency, plays a significant role in developing students' digital competencies and behavioral engagement in learning (Zhao et al., 2024).

One of the main challenges in elementary education, particularly in the subject of Natural and Social Sciences (IPAS), is the low student motivation resulting from the continued use of conventional and monotonous instructional media. Ideally, IPAS learning should foster curiosity, critical thinking, and a holistic understanding of the interrelationship between natural and social phenomena. However, observations at SD Negeri 18 Koto Tinggi revealed that IPAS instruction is still dominated by lecture-based methods using text-heavy materials with minimal visual support. Consequently, students tend to be less enthusiastic and passive during classroom activities. Previous studies have shown that students' interest in science tends to decline when learning lacks hands-on activities, experiments, or inquiry-based discussions that stimulate curiosity (Tröbst et al., 2016). In contrast, interactive and hands-on learning experiences, such as experiments or the use of technology, have been found to be more effective in increasing student engagement and interest compared to traditional methods (Mansour, 2025).

The innovation of learning media therefore becomes an important solution to improve students' motivation and learning outcomes. One promising innovation is the use of interactive educational comics, which combine appealing visual and narrative elements to convey educational messages effectively. The use of illustrated sequential storytelling helps students understand concepts more easily, enjoyably, and contextually. Educational comics that integrate visual and narrative components make learning materials more engaging, accessible, and help students concretize abstract information through contextual visualization (Khotimah & Hidayat, 2022; Kusmaryono, 2025; Marhaeni et al., 2024; Berger et al., 2023). The use of e-comics and digital comics across various disciplines, from accounting and mathematics to character education, has consistently shown positive impacts on motivation, engagement, and academic achievement compared to conventional teaching methods (Ramadana & Widayati, 2025; Khotimah & Hidayat, 2022; Nasution et al., 2023; Farhan et al., 2024; Da'i & Apriyanto, 2025).

Moreover, educational comics encourage active student participation in discussions and creative projects while promoting confidence and critical thinking (Yustanti et al., 2025; Marhaeni et al., 2024; Nasution et al., 2023). Digital comics are also well-suited to the characteristics of elementary students, who are predominantly visual learners and require contextual and enjoyable learning materials (Yulianti et al., 2025; Berger et al., 2023). However, the successful implementation of educational comics depends on adequate infrastructure, teacher training, and collaboration with parents to optimize their benefits in 21st-century learning (Yulianti et al., 2025).

The use of Canva as a graphic design platform offers significant opportunities for the development of creative and accessible learning media. Canva provides a wide range of visual templates, icons, and interactive elements that can be utilized to design engaging digital educational comics for both teachers and students. Through Canva-based educational comics, IPAS learning can become more engaging, interactive, and capable of fostering active student participation. Empirical studies have demonstrated that Canva-based interactive comics are highly valid, feasible, and effective in improving elementary students' learning outcomes, motivation, and engagement in science-related subjects (Sugiantara et al., 2024; Shahwa et al., 2024; Selviana & Ahmadi, 2024; Hasibuan et al., 2024). Canva's visual and interactive features enable teachers to design appealing learning materials that are accessible and aligned with students' characteristics, thereby transforming abstract content into concrete and enjoyable forms (Sugiantara et al., 2024; Shahwa et al., 2024; Wulandari & Mudinillah, 2022; Susanti et al., 2025).

Based on this background, this study aims to develop an interactive Canva-based educational comic for IPAS learning in elementary schools that is valid, practical, and effective as an innovative learning medium. The research is expected to contribute to improving the quality of IPAS learning through the integration of technology and visual media suited to the learning characteristics of 21st-century students.

Method

Research Approach and Rationale

This study employed a Research and Development (R&D) approach that focuses on the process of developing and testing the effectiveness of an

educational product. This method was chosen because it aligns with the research objective, which is to produce a Canva-based interactive educational comic that is valid, practical, and effective in supporting the learning of Natural and Social Sciences (IPAS) in elementary schools. The R&D approach allows researchers to produce products that are not only theoretical but also applicable through empirical testing in the field (Sugiyono, 2017). Therefore, this method serves not only to develop new learning media but also to ensure that the product meets the feasibility standards required in the context of elementary education. The research procedure is presented in Figure 1.

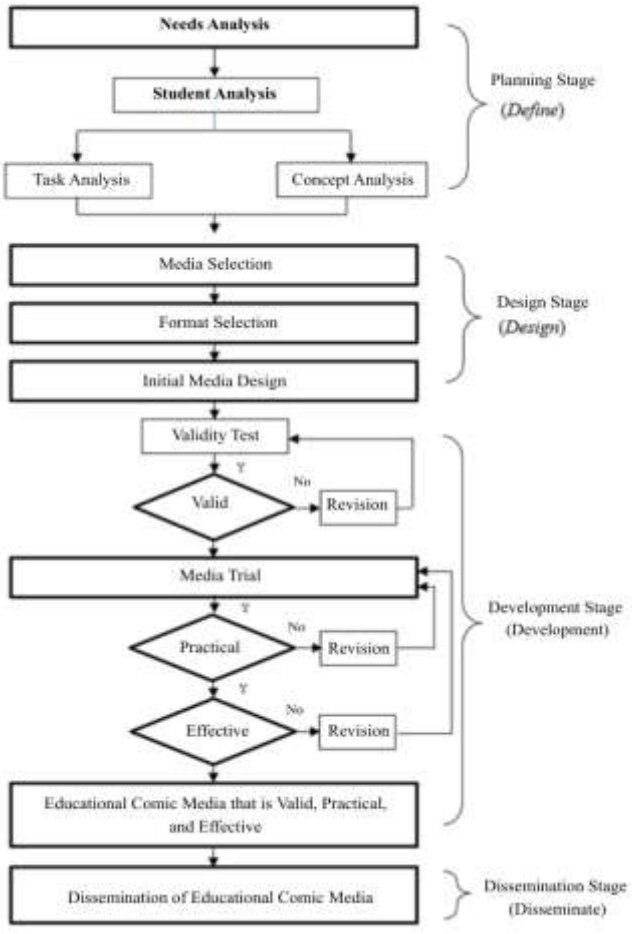

Figure 1. Research Procedure

Development Model Employed

The development model applied in this study refers to the 4D model (Define, Design, Develop, Disseminate) proposed by Thiagarajan, Semmel, and Semmel (1974). This model was selected because it is systematic and structured, providing clear guidance for researchers to produce learning products of tested quality.

The Define stage includes needs analysis, learner characteristics analysis, concept analysis, and formulation of learning objectives. The Design stage involves preparing the initial design of the media, developing the storyboard, and selecting visual formats suitable for elementary school students. The Develop stage consists of validation processes by material experts, media experts, and language experts, followed by product revisions based on feedback from the validators. Finally, the Disseminate stage is conducted to distribute the product through limited field trials in order to obtain feedback regarding its practicality and effectiveness (Winaryati et al., 2021).

Research Participants and Data Collection Procedures

The research subjects were fifth-grade students of SD Negeri 18 Koto Tinggi, Palembayan District, Agam Regency, West Sumatra. The selection of subjects was carried out purposively, considering that fifth-grade students have adequate reading and comprehension skills and have studied the IPAS topic "Economic Conditions in My Region." The research data were collected through questionnaires, observations, and learning achievement tests. The questionnaires were used to obtain data on the validity of the product from experts as well as responses from students and teachers regarding its practicality. The learning achievement tests were employed to measure the effectiveness of the media in improving students' conceptual understanding.

Data Analysis Techniques

The data obtained were analyzed using a descriptive quantitative approach. Validity analysis was performed by calculating the average scores from expert evaluations on the content, design, and linguistic aspects of the media. Practicality analysis was derived from teacher and student response questionnaires, which were interpreted qualitatively. Meanwhile, the effectiveness of the media was assessed by comparing the pretest and posttest results to determine students' learning improvement. The increase in learning outcomes was analyzed using the N-Gain formula (Hake, 1998), and the effectiveness categories were determined based on Hake's criteria, which include low, medium, and high levels. This analysis aimed to ensure that the developed media are not only theoretically feasible but also empirically effective in the context of IPAS learning in elementary education.

Result and Discussion

Development Process of the Interactive Educational Comic Media

This study produced a final product in the form of interactive educational comic media based on Canva, developed using the 4D model (Define, Design, Develop, Disseminate). At the Define stage, a needs

analysis was conducted through observations and interviews with teachers at SD Negeri 18 Koto Tinggi. The analysis revealed that IPAS learning media were still dominated by conventional materials such as printed textbooks and student worksheets (LKPD) without the support of engaging visual illustrations. This condition resulted in low student enthusiasm during learning activities.

The Design stage produced an initial draft of the media in the form of a storyboard and comic script with the theme "Economic Conditions in My Region." The comic was designed using Canva by integrating visual elements such as colorful images, child characters, and dialogue balloons to enhance visual appeal. The media was then converted into HTML5 format and packaged as an APK file to make it accessible through Android-based devices.

The Develop stage involved validation by three experts, namely material, media, and language experts. The validation results showed that all aspects were rated as very valid, with average scores of 97.5% for material, 97.2% for media, and 100% for language aspects. The Disseminate stage was carried out through limited trials involving students and teachers at SD Negeri 18 Koto Tinggi to assess the practicality and effectiveness levels of the media.

Media Validity Results

The validation process aimed to ensure the feasibility of the developed educational comic media. The assessment covered three aspects: content/material, media display, and language. The results are presented in the following table.

Table 1. Results of Interactive Educational Comic Media Validation

Assessment Aspect	Average Score (%)	Category
Content/Material	97.5	Very Valid
Media Display	97.2	Very Valid
Language	100	Very Valid
Overall Average	98.2	Very Valid

These results indicate that the Canva-based interactive educational comic media is highly suitable for use in IPAS learning. This finding is consistent with studies by Megantari et al. (2021) and Rusdiana & Febrianto (2024), which also demonstrated high validity levels in the development of digital comic media. The combination of engaging text and visuals was found to enhance the quality and feasibility of instructional materials.

Practicality Test Results

The practicality test was conducted in two stages: small group and large group trials. The small group test involved five fifth-grade students, while the large group test involved twelve students and two teachers. The results indicated that the interactive educational comic media was easy to use, engaging, and helped improve students' understanding of local economic concepts. The results are presented in the following table.

Table 2. Results of the Media Practicality Test

Respondents	Percentage (%)	Category
Students (Trial I)	92.7	Very Practical
Students (Trial II)	95.3	Very Practical
Teachers	96.0	Very Practical
Overall Average	94.7	Very Practical

The findings demonstrate that the media is highly practical for classroom use. Teachers reported that it helps create an active and enjoyable learning environment, while students stated that the colorful comic visuals and simple narrative made it easier to understand the material. This result aligns with Agustina (2020), who found that educational comics can significantly enhance student engagement and comprehension in reading and learning activities.

Effectiveness Test Results

The effectiveness test compared pretest and posttest scores to measure students' learning improvement after using the educational comic media. The N-Gain formula was used to analyze the improvement, resulting in an average N-Gain score of 0.74, categorized as *high.* Therefore, the Canva-based educational comic media was proven effective in improving students' learning outcomes.

The improvement indicates that interactive educational comic media can stimulate students' attention, facilitate conceptual understanding, and enhance learning motivation. This finding is supported by Waisakanitri et al. (2023), who found that digital comic media based on problem-based learning significantly improved science learning outcomes.

Discussion of Findings

The results confirm that Canva-based interactive educational comic media is valid, practical, and effective for IPAS learning in elementary schools. The media serves not only as a visual aid but also as an interactive learning tool that promotes active student participation. The combination of text, images, and interactive narratives effectively facilitates students' understanding of local economic concepts that were previously considered abstract.

Compared with previous studies (Megantari et al., 2021; Rusdiana & Febrianto, 2024; Agustina, 2020), this research shows superiority in terms of media flexibility since it is Canva-based and accessible offline after being

converted into an APK file. Moreover, its alignment with the *Merdeka Curriculum* and local wisdom enhances the contextual relevance of the media to the Indonesian educational setting. Thus, Canva-based media development represents not only a technological innovation but also a pedagogical approach that supports contextual, creative, and student-centered learning.

The high levels of validity, practicality, and effectiveness strengthen the argument that integrating visual, textual, and interactive elements in learning media enhances conceptual understanding (Arsyad, 2019). The success of this media is grounded in Mayer's (2009) *Cognitive Theory of Multimedia Learning,* which posits that students learn more effectively when information is presented both visually and verbally. Therefore, this educational comic media not only enriches the learning experience but also helps students process information through balanced visual and auditory channels (Abrori et al., 2023).

The effectiveness results, reflected in the N-Gain score of 0.74, indicate that the media facilitates meaningful learning. This aligns with Bruner's (1996) view that visual representation plays a vital role in learning, particularly during the concrete operational stage of elementary students. The combination of illustrations, narratives, and characters in comics fosters emotional engagement, strengthens attention, and supports knowledge retention. Educational and digital comics consistently increase attention, motivation, and classroom engagement across subjects, including science, environmental education, language, and character education (Rina et al., 2020; Şentürk & Selvi, 2023). Additionally, the use of Canva allows teachers to adapt the media to specific needs, promoting flexibility and personalization in 21st-century learning (Sahelatua, 2018).

This study contributes both methodologically and pedagogically. Methodologically, it extends the application of the 4D model in digital media development relevant to the *Merdeka Curriculum*. Pedagogically, it offers a contextual and enjoyable alternative learning tool that aligns with the characteristics of digital-native learners. This research enriches the literature on digital comic media development, which previously focused more on science and language subjects, by introducing Canva-based innovation that can be accessed offline, thus addressing internet access limitations in rural areas (Waisakanitri et al., 2023).

However, recent systematic literature reviews emphasize that although the 4D model is dominant in educational product development, many studies still lack strong empirical validation and contextual adaptation to current educational demands. Scholars therefore encourage the application of the 4D model in new educational contexts and in alignment with contemporary curriculum frameworks (Indaryanti et al., 2025; Rizky & Suparman, 2025). In response to this need, applying the 4D model within the Merdeka Curriculum framework provides methodological relevance, since it situates product development in a competency oriented and project based national policy environment (Maulisa et al., 2025; Rachman & Wibowo, 2025; Wasehudin et al., 2023; Wati et al., 2025).

However, this study has several limitations. First, the trial was conducted on a limited scale in one school, so generalization requires broader testing. Second, the duration of media implementation was relatively short, making it difficult to assess long-term impacts on students' critical thinking or scientific literacy skills. Future studies are recommended to involve more schools with diverse socioeconomic backgrounds and to expand testing to other competencies such as collaboration and creativity. Moreover, integrating interactive features with game-based elements may offer new directions to further enhance sustained student engagement.

Overall, this study emphasizes that the development of Canva-based educational comic media is a strategic step in optimizing innovative, contextual, and digitally oriented IPAS learning aligned with the demands of 21st-century education.

Conclusion

This study aimed to develop interactive educational comic media based on Canva for IPAS learning in elementary schools, and the findings demonstrate that the product is highly valid, practical, and effective based on the 4D development model. The validity results reached 98.2 percent, indicating strong feasibility in terms of content accuracy, linguistic clarity, and visual quality. The practicality level was 94.7 percent, showing that the media is easy to use, supports smooth classroom implementation, and creates an enjoyable learning environment for both teachers and students. Its effectiveness was evidenced by an N Gain score of 0.74 categorized as high, reflecting significant improvement in students learning outcomes. In addition, classroom observations and responses revealed increased student motivation, active participation, and better conceptual understanding. Overall, the Canva based educational comic media contributes to innovative digital learning resources that support meaningful learning, align with the Merdeka Curriculum, and meet the learning needs of twenty first century elementary students.

Acknowledgments
The author would like to express sincere gratitude to the principal, teachers, and students of SD Negeri 18 Koto Tinggi for their participation and support during the research process. Appreciation is also extended to the expert validators who provided constructive feedback that contributed significantly to the improvement of the interactive educational comic media.

Author Contributions
Conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, writing—review and editing, visualization, supervision, and project administration, Rina Devi.
Expert consultation and valuable feedback were provided by Abna Hidayati, Yalvema Miaz, Elfia Sukma, Rahmi Pratiwi (media expert), Yuli Tiarina (content expert), and Adrias (language expert).
All contributors have provided constructive insights and guidance throughout the research process. The author has read and agreed to the published version of the manuscript.

Funding
This research received no external funding.

Conflicts of Interest
The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

References

Abrori, F. M., Prodromou, T., Alagic, M., Livits, R., Kasti, H., Lavicza, Z., & Anđić, B. (2023). Integrating mathematics and science to explain socioscientific issues in educational comics for elementary school students. *Journal of Graphic Novels and Comics, 15*, 508–524. https://doi.org/10.1080/21504857.2023.2292734

Agustina, I. A. (2020). *Pengembangan Media Komik Edukatif untuk Meningkatkan Kemampuan Membaca Pemahaman Siswa Kelas V SD Islam Imama Mijen*. Jurnal Inovasi Pendidikan Dasar, 5(2), 101–112.

Akram, H., Abdelrady, A., Al-Adwan, A., & Ramzan, M. (2022). Teachers' Perceptions of Technology Integration in Teaching-Learning Practices: A Systematic Review. *Frontiers in Psychology*, 13. https://doi.org/10.3389/fpsyg.2022.920317

Alam, A., & Dewi, A. (2024). Integration of Education in Human Resource Development: Transformation of the Human Resource Management Paradigm. *Maneggio*. https://doi.org/10.62872/j21cjs66

Berger, M., Michael, G., & Christoph, N. (2023). E-comics: Pictorial Learning Media to Train Students' Viewing Skills. *Journal Emerging Technologies in Education*. https://doi.org/10.55849/jete.v1i1.188

Consoli, T., Schmitz, M., Antonietti, C., Gonon, P., Cattaneo, A., & Petko, D. (2024). Quality of technology integration matters: Positive associations with students' behavioral engagement and digital competencies for learning. *Education and Information Technologies*, 30, 7719 - 7752. https://doi.org/10.1007/s10639-024-13118-8

Da'i, M., & Apriyanto, R. (2025). Integrating digital comics into physical education: a new model for enhancing elementary athletic learning. *Edu Sportivo: Indonesian Journal of Physical Education*. https://doi.org/10.25299/esijope.2025.vol6(1).18645

Farhan, D., Ikhsan, M., & Elizar, E. (2024). Mathematics e-comic in cultural context to improve student motivation and learning outcomes. *Al-Jabar : Jurnal Pendidikan Matematika*. https://doi.org/10.24042/ajpm.v15i2.22327

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

Hasibuan, R., Hader, A., & Wulandari, L. (2024). Pengembangan Media Pembelajaran E-Komik dengan Menggunakan Aplikasi Canva pada Materi Wujud Zat dan Perubahannya Kelas IV Sekolah Dasar. *Jurnal Ilmiah Dikdaya*. https://doi.org/10.33087/dikdaya.v14i2.673

Indaryanti, R. B., Harsono, H., Sutama, S., Murtiyasa, B., & Soemardjoko, B. (2025). 4D research and development model: Trends, challenges, and opportunities review. *Jurnal Kajian Ilmiah*. https://doi.org/10.31599/na7deq07

Khotimah, H., & Hidayat, N. (2022). Interactive Digital Comic Teaching Materials to Increase Student Engagement and Learning Outcomes. *International Journal of Elementary Education*. https://doi.org/10.23887/ijee.v6i2.46038

Kusmaryono, I. (2025). Evaluation of the Effect of Digital Comics on Learning: How are Students' Motivation and Emotional Reactions?. *International Journal of Information and Education Technology*. https://doi.org/10.18178/ijiet.2025.15.1.2232

Mansour, N. (2025). Like or Not Like Studying Science: Exploring Students' Personal and Cultural Characteristics. *Canadian Journal of Science, Mathematics and Technology Education*. https://doi.org/10.1007/s42330-025-00352-6

Marhaeni, N., Arnal-Palacián, M., & Irfan, M. (2024). Interactive math comics: An analysis of Indonesian and Spanish students' responses. *Infinity Journal*. https://doi.org/10.22460/infinity.v14i1.p143-162

Maulisa, M., Rahmawati, E. S., & Zainuri, H. (2025). Learning methods for Islamic religious education in the Merdeka Curriculum. *ISTIFHAM: Journal of*

Islamic Studies. https://doi.org/10.71039/istifham.v2i3.69

Megantari, D. A., Artawan, A., & Sudiana, I. K. (2021). *Pengembangan Media Komik Digital untuk Meningkatkan Motivasi Belajar Siswa Sekolah Dasar.* Jurnal Pendidikan dan Teknologi Pembelajaran, 8(1), 45–56.

Nasution, W., Khadna, S., Purba, R., Khairunnisah, W., & Nirwana, N. (2023). Enhancing Student Interest and Learning Outcomes Fiqh Education in Madrasah Ibtida'iyah through Comic-Based Student Worksheets (LKPD): A Research and Development Approach. *Jurnal Pendidikan Islam*. https://doi.org/10.14421/jpi.2023.122.243-254

Rachman, B., & Wibowo, S. E. (2025). The use of problem-based learning model to improve integrated thematic learning outcomes. *Jurnal Pedagogi dan Pembelajaran*. https://doi.org/10.23887/jp2.v8i1.87028

Ramadana, N., & Widayati, A. (2025). Development of E-Comic Based Learning Media to Increase Student Learning Motivation on Journal Material Adjusted by Service Companies for Class XII High School Students. *International Journal of Educational Development*. https://doi.org/10.61132/ijed.v2i1.169

Rina, N., Suminar, J., Damayani, N. A., & Hafiar, H. (2020). Character education based on digital comic media. *International Journal of Interactive Mobile Technologies, 14*, 107–127. https://doi.org/10.3991/ijim.v14i03.12111

Rizky, M. R. F., & Suparman, S. (2025). Global research trends on 4D in education using bibliometrics analysis techniques. *Jurnal Mercumatika: Jurnal Penelitian Matematika dan Pendidikan Matematika*. https://doi.org/10.26486/jm.v9i1.4523

Rofik, M., , M., Wiyani, N., K.H, N., Zuhri, S., & Purwokerto, I. (2025). Human Resource Development through Education and Training: Literature Review and Applications in Organizations. *International Journal of Scientific Research and Management (IJSRM)*. https://doi.org/10.18535/ijsrm/v13i05.sh03

Rusdiana, E., & Febrianto, A. (2024). *Pengembangan Media Komik Digital IPAS untuk Sekolah Dasar.* Jurnal Inovasi Pendidikan, 12(3), 210–223.

Selviana, R., & Ahmadi, F. (2024). Development of Marbel Sitasya Interactive Learning Media Based on Canva to Improve Science Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*. https://doi.org/10.29303/jppipa.v10ispecialissue.7536

Şentürk, Ö. Ç., & Selvi, M. (2023). Argumentation-supported educational comics as a teaching tool for environmental education. *Environmental Education Research, 30*, 170–189. https://doi.org/10.1080/13504622.2023.2227357

Shahwa, D., Mustamiroh, M., & Iksam, I. (2024). Pengembangan Bahan Ajar E-Comic melalui Aplikasi Canva pada Mata Pelajaran IPAS di Sekolah Dasar. *SITTAH: Journal of Primary Education*. https://doi.org/10.30762/sittah.v5i2.3494

Sugiantara, I., Yudiana, K., & Sukmayasa, M. (2024). Canva-Based Interactive Digital Comics on Science Content to Enhance Elementary School Students' Learning Outcomes. *International Journal of Language and Literature*. https://doi.org/10.23887/ijll.v8i1.93084

Sugiyono. (2017). *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.

Susanti, D., Sultonurohmah, N., & Purwitasari, E. (2025). The Effectiveness of Using Canva Application as A Science Learning Media in Elementary Schools. *BASICA Journal of Arts and Science in Primary Education*. https://doi.org/10.37680/basica.v4i2.6393

Taufiqurrahman, M. (2024). The Role of Educational Philosophy in Human Resource Development. *JUPE : Jurnal Pendidikan Mandala*. https://doi.org/10.58258/jupe.v9i4.7786

Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). *Instructional Development for Training Teachers of Exceptional Children: A Sourcebook.* Indiana University.

Tröbst, S., Kleickmann, T., Lange-Schubert, K., Rothkopf, A., & Möller, K. (2016). Instruction and Students' Declining Interest in Science. *American Educational Research Journal*, 53, 162 - 193. https://doi.org/10.3102/0002831215618662

Waisakanitri, I. D. A. T., Putra, I. N. G., & Dewi, N. M. S. (2023). *Media Komik Digital Berbasis Problem Based Learning Muatan IPA Kelas V Sekolah Dasar.* Jurnal Pendidikan Dasar Nusantara, 9(2), 55–65.

Wasehudin, W., Rohman, A., Wajdi, M. B. N., & Marwan, M. (2023). Transforming Islamic education through Merdeka Curriculum in pesantren. *Jurnal Pendidikan Islam*. https://doi.org/10.15575/jpi.v9i2.28918

Wati, E., Amanda, S., Rahayuningsih, V. P., & Revita, R. (2025). Efektivitas Kurikulum Merdeka dalam meningkatkan kualitas pendidikan. *Perspektif: Jurnal Pendidikan dan Ilmu Bahasa*. https://doi.org/10.59059/perspektif.v3i2.2458

Winaryati, E., Mesra, D., & Salsabila, R. (2021). *Model Pengembangan 4D dalam Penelitian Pendidikan.* Jurnal Inovasi Pendidikan, 10(2), 45–53.

Wulandari, T., & Mudinillah, A. (2022). Efektivitas Penggunaan Aplikasi CANVA sebagai Media

Pembelajaran IPA MI/SD. *Jurnal Riset Madrasah Ibtidaiyah (JURMIA)*. https://doi.org/10.32665/jurmia.v2i1.245

Yulianti, M., Usman, H., & Yunus, M. (2025). Needs Analysis for Educational Comic Media as a Learning Tool in Elementary Schools. *EDUCARE: Journal of Primary Education*. https://doi.org/10.35719/educare.v6i1.367

Yustanti, E., Ikhwan, A., & Erwahyudin, D. (2025). Applying comic strip media in Pancasila and civic education to improve student learning outcomes at Malaysian school. *JPP (Jurnal Pendidikan dan Pembelajaran)*. https://doi.org/10.17977/um047v32i12025p1-9

Zhao, X., Ertmer, P., Pelgrumen, C., Watsonta, J., & Tanu, M. (2024). The Impact of Technology Integration on Student Learning Outcomes. *Journal of Teaching and Learning*. https://doi.org/10.71305/jtl.v1i1.108