East Asian Journal of Multidisciplinary Research (EAJMR)
Vol. 4, No. 4, 2025: 1843 – 1854

The Influence of Electronic Comic Media on the Discovery Learning Model on Chemistry Learning Attitudes and Outcomes

Rahmawati M[1]*, Muhammad Anwar[2], Firdaus Daud[3], Sakinah Zubair[4]
Chemistry Education, State University of Makassar
Corresponding Author: Rahmawati M r4hm4w4t1.rm@gmail.com

A R T I C L E I N F O

Keywords: Electronic Comic Media, Discovery Learning, Learning Attitudes, Learning Outcomes, Hydrocarbons

Received : 14, March
Revised : 27, March
Accepted: 28, April

A B S T R A C T

This research is a quasi-experimental study designed to investigate the impact of electronic comic media on the learning attitudes and academic performance of 11th-grade science students at SMAN 4 Gowa. The study population consisted of all students from three science classes in the 11th grade at the school. Data were collected by administering a learning attitude questionnaire and a learning achievement test focused on the hydrocarbon topic, conducted through pretest and posttest assessments. An independent samples t-test was employed for data analysis. Inferential statistical analysis revealed a significance value of 0.000 (< 0.05) for both learning attitudes and learning outcomes. These results indicate that the use of electronic comic media significantly influences both the learning attitudes and academic achievement of 11th-grade science students at SMAN 4 Gowa in studying hydrocarbons.

DOI prefix: https://doi.org/10.55927/eajmr.v4i4.138
ISSN-E: 2828 – 1519
https://mtiformosapublisher.org/index.php/eajmr

INTRODUCTION

One of the main objectives of chemistry learning at the Senior High School (SMA) level is to develop students' critical thinking skills in analyzing and assessing various scientific phenomena that occur in everyday life. In addition, understanding chemical concepts also has an important contribution to the development of students' interests and readiness in career fields such as medicine, pharmacy, environmental technology, and others (Kemendikbudristek, 2022). However, chemistry is still less popular with most students because it is considered difficult and abstract. Based on observations at SMA Negeri 4 Gowa, this has an impact on low learning outcomes, especially in hydrocarbon material.

To overcome this problem, a learning model is needed that can attract interest and encourage student activity. The discovery learning model is one relevant alternative because it emphasizes the active involvement of students in discovering concepts through independent learning experiences (Arsyad & Fahira, 2023). However, the implementation of this model needs to be supported by appropriate learning media. One promising media is electronic comics. Comics as a visual medium are able to bridge abstract concepts with more concrete and interesting representations (Sururi, 2014). The combination of the discovery learning model and electronic comic media is expected to improve positive learning attitudes as well as student learning outcomes in chemistry lessons.

THEORETICAL REVIEW

Chemistry Learning and Its Challenges in High School

Chemistry is a conceptual and abstract subject, so it requires a learning strategy that can bridge theory and practice. According to Azisah et al. (2019), a good understanding of chemical concepts is an important foundation because errors in the initial concept will affect the understanding of the next concept. This is even more challenging in hydrocarbon material which is abstract and requires strong visualization.

Discovery Learning as an Active Learning Model

Discovery learning is a learning model that provides opportunities for students to build their own understanding through concept discovery, problem solving, and reflection (Arsyad & Fahira, 2023). Research by Mukasari (2023) shows that the use of discovery learning in hydrocarbon material can significantly improve student learning outcomes. This model encourages activeness, critical thinking, and deep understanding of concepts.

Electronic Comic Media in Learning

Visual media such as comics have long been known to increase students' interest and understanding of subject matter. Silalahi and Syarifuddin (2010) and Topkaya et al. (2023) revealed that comic media can create a more enjoyable learning atmosphere and foster positive learning attitudes. Electronic comics, which can be accessed via digital devices, provide high flexibility and interactivity so that they can support discovery-based learning. According to

Daryanto (2013), media equipped with attractive images and visuals are preferred by students compared to conventional textbooks.

The Influence of Media on Attitudes and Learning Outcomes

Learning attitude is the affective tendency of students in showing interest and participation in learning. Rosa (2015) stated that a positive attitude towards lessons is correlated with high learning outcomes. In this case, electronic comics are not only able to improve conceptual understanding but also have an impact on motivation, learning satisfaction, and commitment to the learning process (Puspananda, 2022; Putri et al., 2022). Furthermore, research by Marwah et al. (2021) and Sari & Harahap (2021) showed that electronic comic-based learning is effective in improving students' chemistry learning outcomes. This effectiveness was confirmed through a significant comparison of pretest and posttest results.

METHODOLOGY

This study employs a quasi-experimental approach to examine the influence of electronic comic media within the discovery learning model on the attitudes and academic achievement of 11th-grade science students in chemistry, specifically on hydrocarbon topics. The research was conducted during the odd semester of the 2024/2025 academic year at SMAN 4 Gowa.

The study design adopted was the pretest-posttest control group design. The population consisted of three 11th-grade science classes at SMAN 4 Gowa, totaling 98 students. Samples were selected using a simple random sampling method. In the experimental group, students engaged with electronic comic media integrated into the discovery learning model, whereas the control group experienced the discovery learning model without the use of electronic comics. Students' attitudes toward chemistry learning were assessed using a Likert scale questionnaire, while learning outcomes were evaluated through a multiple-choice test. Data analysis included both descriptive and inferential statistics, with normality and homogeneity assumptions tested using SPSS version 26. The independent samples t-test was applied to test the research hypotheses.

RESULTS

Chemistry Learning Attitude

The results of the descriptive analysis of chemistry learning attitudes were carried out with the help of SPSS 26, the results of which can be seen in Table 1.

Table 1. Descriptive Statistics of Students' Learning Attitudes

Descriptive Statistics	Statistical Values			
	Experimental Class		**Control Class**	
	Pretest	***Posttest***	***Pretest***	***Posttest***
Sample	33	33	34	34
The highest score	93	100	89	96
Lowest value	55	73	60	68
Average value	77.42	89.33	75.21	84.03

Standard deviation	10,137	7,773	7,083	6,663
N-Gain	0.6		0.3	

Table 1 presents the descriptive statistics comparing the experimental and control classes. The descriptive analysis results indicate that the experimental class outperformed the control class. This is reflected in the higher mean, maximum, and minimum scores achieved by students in the experimental group. Furthermore, Table 2 displays the frequency distribution and percentage of students' learning attitudes who were taught using electronic comic media integrated into the discovery learning model.

Table 2. Frequency Distribution of Learning Attitudes in Experimental Class

Interval	**Category**	***Pretest***		***Posttest***	
		Frequency	**Percentage**	**Frequency**	**Percentage**
85 - 100	Very high	9	27	25	76
70 - 84	Tall	15	45	8	24
55 - 69	Currently	9	27	0	0
40 - 54	Low	0	0	0	0
25 - 39	Very Low	0	0	0	0
Amount		33	100	33	100

Table 2 demonstrates a notable improvement in the learning attitudes of students in the experimental class. Additionally, the frequency distribution and percentage of students' learning attitudes in the control class are presented in Table 3.

Table 3**.** Frequency Distribution of Learning Attitudes in Control Class

Interval	**Category**	***Pretest***		***Posttest***	
		Frequency	**Percentage**	**Frequency**	**Percentage**
85 - 100	Very high	3	9	14	41
70 - 84	Tall	24	71	18	53
55 - 69	Currently	7	21	2	6
40 - 54	Low	0	0	0	0
25 - 39	Very Low	0	0	0	0
Amount		34	100	34	100

When comparing the learning attitudes between students in the experimental and control classes, both groups exhibited improvements. However, the percentage increase in learning attitudes was greater in the experimental class, where electronic comic media was integrated into the discovery learning model, compared to the control class, which did not utilize such media.

Inferential statistical analysis was performed by first conducting prerequisite tests, including the normality and homogeneity tests. Upon confirming that the learning attitude data were normally distributed and homogeneous, an independent samples t-test was conducted to test the hypothesis. The t-test results yielded a significance value (one-tailed) of 0.000, which is less than 0.05. This result leads to the rejection of the null hypothesis (Ho) and acceptance of the alternative hypothesis (H1), indicating that the use of electronic comic media within the discovery learning model significantly

influences the chemistry learning attitudes of 11th-grade science students at SMAN 4 Gowa in the Hydrocarbon topic.

Chemistry Learning Outcomes

The descriptive analysis results of students' learning outcomes in both the control and experimental classes are presented in Table 4.

Table 4. Description of learning outcomes of the control class and experimental class

Descriptive Statistics	**Statistical Values**			
	Experimental Class		**Control Class**	
	Pretest	***Posttest***	***Pretest***	***Posttest***
Sample	33	33	34	34
The highest score	45	100	40	95
Lowest value	5	55	5	35
Average value	23.48	80.91	24.26	70.59
Standard deviation	11.14	12.15	7.50	14.29
N-Gain	0.8		0.6	

Based on the pretest and posttest scores of students in both the control and experimental classes, the N-Gain values were calculated and are shown in Table 5.

Table 5. Description of N-Gain Learning Outcomes of Control Class and Experimental Class

Criteria	Experimental Class	Control Class	Category
g>0.7	21	12	Tall
0.3≤g≤0.7	12	22	Currently
g<0.3	0	0	Low

Following the prerequisite tests for normality and homogeneity, it was determined that both sample classes exhibited normal and homogeneous distributions. Subsequently, a hypothesis test was conducted using the independent samples t-test, resulting in a significance value of less than 0.05. This outcome leads to the rejection of the null hypothesis (Ho) and acceptance of the alternative hypothesis (H1), indicating that the average N-Gain of the experimental class is higher than that of the control class. Therefore, it can be concluded that the integration of electronic comic media into the discovery learning model has a significant impact on the learning outcomes of 11th-grade science students at SMAN 4 Gowa in studying Hydrocarbon material.

DISCUSSION

The Impact of Electronic Comic Media on Discovery Learning Models in Shaping Learning Attitudes

This study aims to examine the influence of incorporating electronic comic media into the discovery learning model on students' attitudes toward learning chemistry. In the experimental group, electronic comic media were utilized, whereas the control group implemented discovery learning without the

integration of comics. The results of the descriptive statistical analysis indicate that the experimental class demonstrated higher learning attitudes compared to the control class. The N-Gain score for the control class was 0.3, while the experimental class achieved an N-Gain of 0.6, both classified within the moderate category. Topkaya et al. (2023) emphasized that comics can enhance both cognitive and affective domains, contributing to improved academic performance and fostering positive learning attitudes among students. Their study found that the use of educational comics significantly influenced students' attitudes, with an N-Gain value of 0.70, also categorized as moderate.

The analysis of the frequency distribution data of learning attitudes for both the control and experimental classes, as shown in Table 2 and Table 3, indicates an increase in students' learning attitudes after treatment compared to before the intervention. This is evidenced by the higher percentage of students' positive learning attitudes following the application of the treatment. Consequently, it can be concluded that electronic comic media integrated into the discovery learning model has an influence on the learning attitudes of students in the experimental class, while the control class, which utilized discovery learning without comic media, also showed improvement but to a lesser degree. The increase in learning attitudes was notably greater in the experimental class compared to the control class. These findings are consistent with Widyawati and Wijayanti (2019), who reported that science comics based on character education positively impact students' learning attitudes, with experimental groups displaying greater engagement than control groups. Further analysis of the learning attitude indicators revealed that students' perceptions of chemical concepts in the control class—where discovery learning was applied without comic media—were significantly lower. This suggests that the discovery learning model alone may not be sufficiently effective without the support of appropriate media. This finding is in line with research by Istiqomah (2022), who demonstrated that combining discovery learning with electronic comic media improved students' learning outcomes, as evidenced by an increase in average scores from 69.4% to 86%.

Inferential statistical analysis using an independent samples t-test via SPSS 26 yielded a significance value (one-tailed) of 0.000, which is less than 0.05. This result leads to the rejection of the null hypothesis and the acceptance of the alternative hypothesis (H1), affirming that electronic comic media has a significant impact on students' learning attitudes.

A deeper exploration of the role of electronic comic media within the discovery learning framework reveals that such media effectively captures students' attention in chemistry learning. The visually appealing design, vibrant characters, and engaging storylines contribute to heightened student interest. Suparmi et al. (2024) emphasized that comic media enhances student engagement, making learning more interactive and enjoyable. Electronic comic media supports the development of learning attitudes across three domains: cognitive, affective, and conative. In the cognitive domain, visually attractive comics facilitate students' understanding of chemical concepts and their relevance, as highlighted by Ubaidillah (2017). In the affective domain,

the engaging presentation fosters a positive learning atmosphere and reduces students' anxiety toward chemistry. Nafala (2022) further pointed out that electronic comics increase student focus and participation by offering accessible, visually engaging content, thereby enhancing learning enjoyment and efficiency. Regarding the conative domain, the media encourages students' willingness to engage in independent learning, seek supplementary resources, and actively participate in discussions and laboratory activities. This reflects an increase in their intrinsic motivation toward chemistry. Supporting this, Puspananda (2022) observed that comics generally boost students' interest, participation, and academic outcomes while positively influencing learning attitudes.

Additionally, Putri et al. (2022) corroborated these findings by reporting that e-comics significantly enhanced students' learning attitudes, with cognitive, affective, and conative scores reaching 91%, 89%, and 87.1%, respectively. Thus, integrating electronic comic media into the discovery learning model has been statistically and practically proven to positively impact the chemistry learning attitudes of 11th-grade science students at SMAN 4 Gowa.

The Influence of Electronic Comic Media on Discovery Learning Models on Learning Outcomes

This study aims to investigate the impact of electronic comic media on students' learning outcomes related to hydrocarbon compound topics. The results of the descriptive statistical analysis reveal that the experimental class, which implemented electronic comic media within the discovery learning model, achieved a higher average posttest score (80.91) compared to the control class that employed the discovery learning model without the comics (70.59). These findings are consistent with those of Bukian et al. (2024), who reported a significant difference in learning outcomes between students who utilized e-comic media and those who did not. Their study highlighted that the integration of e-comics significantly enhanced both student achievement and learning interest.

Further analysis using the N-Gain metric indicates that the experimental class exhibited a greater improvement in learning outcomes (0.8, categorized as high) compared to the control class (0.6, categorized as moderate). These results align with the study conducted by Safitri and Nurharini (2024), which demonstrated that learning supported by digital STRIP comics can significantly enhance student performance, as evidenced by the higher achievement scores observed in the experimental group relative to the control group.

The discovery learning model integrated with electronic comic media creates a different learning atmosphere for students from the previous method, which encourages students to be more motivated and active during learning. This makes the hydrocarbon compound material more meaningful and easier to remember in the long term. This positive impact contributes to improving student learning outcomes. This is in line with research conducted by Dahlan, Sugiarti and Hasri (2023) which concluded that the use of the discovery learning model has an effect on students' critical thinking skills and redox learning outcomes.

The results of the inferential statistical analysis, conducted using an independent samples t-test, indicated a significance value (Sig. 1-tailed) of 0.000, which is less than 0.05. This finding leads to the rejection of the null hypothesis (Ho) and the acceptance of the alternative hypothesis (H1), confirming that the integration of electronic comic media within the discovery learning model significantly affects student learning outcomes.

One major advantage of electronic comic media is its ability to present complex chemical concepts through engaging visual narratives, thereby enhancing students' comprehension. Cotiangco et al. (2024) demonstrated that Android-based audiovisual comics effectively improved students' conceptual understanding of chemical bonding. Furthermore, the use of electronic comic-based materials contributes to greater content retention and increased student engagement during the learning process. This finding is further supported by Marwah, Ramlawati, and Syahrir (2021), whose research showed that the use of electronic comic media led to a high N-Gain score of 0.71, indicating significant learning improvement. Similarly, the study by Silalahi and Syarifuddin (2010) revealed that students exposed to comic-integrated discovery learning models achieved higher average scores compared to those who learned without comics.

Moreover, Istiqomah (2022) emphasized that the discovery learning model, when combined with interactive media such as comics, fosters greater student participation and engagement. Electronic comic media encourages students to explore chemical concepts independently, enhances motivation, and strengthens both the understanding and retention of learned materials. Thus, the findings of this study clearly show that incorporating electronic comic media into the discovery learning model has a positive and significant impact on students' chemistry learning outcomes, particularly regarding hydrocarbon topics.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study, it can be concluded that the use of electronic comic media in the discovery learning model has a significant effect on improving the learning attitudes and learning outcomes of class XI IPA students of SMA Negeri 4 Gowa on hydrocarbon material. This is evidenced by an increase in the average posttest score, a higher N-Gain, and the results of inferential tests that show statistical significance in both aspects of attitude and learning outcomes. Electronic comics, with attractive visual displays and contextual narratives, have been shown to facilitate the process of discovering abstract chemical concepts more easily, enjoyably, and motivate students to learn actively. Therefore, it is recommended that chemistry teachers integrate electronic comic media into the discovery learning model more broadly as an innovative alternative in learning. Schools also need to support teacher training in the development of electronic comic media in order to optimize the learning process and create a more effective, creative, and meaningful learning atmosphere.

FURTHER STUDY

Development and effectiveness test of interactive electronic comic media based on Android that not only presents images and narratives, but is also equipped with audio, animation, and interactive quiz features to maximize student engagement. This study can use the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model and be applied to various chemical materials other than hydrocarbons, such as electrolyte and non-electrolyte solutions, redox reactions, or stoichiometry, to see the consistency of media effectiveness. This study can also expand the subject at different grade levels or in schools with diverse student characteristics, including in 3T (underdeveloped, leading, and outermost) areas. In addition, the aspects analyzed can be added such as critical thinking skills, science literacy, and student learning motivation. Thus, this follow-up research not only contributes to the development of innovative learning media, but also broadens the understanding of its impact on the achievement of 21st century competencies.

ACKNOWLEDGMENT

The researcher extends her heartfelt gratitude to all individuals and institutions who have provided support and contributions throughout the preparation and execution of this study. Special thanks are directed to SMA Negeri 4 Gowa for granting permission and offering the opportunity to carry out this research. Appreciation is also given to the chemistry teachers and students who participated with enthusiasm and provided valuable data. Furthermore, the researcher sincerely acknowledges the assistance, feedback, and encouragement received from various parties during the research process. It is hoped that the findings of this study will contribute meaningfully to the advancement of more innovative and impactful chemistry learning practices.

REFERENCES

Arsyad, M & Fahira, E. 2023. Learning Models in the Independent Curriculum. Purbalingga: Eureka Media Aksara

Asmiarsih, NS, & Rusmini. 2019. The development of chemtoon (Chemistry Cartoon) comic as Chemistry Learning Media on Acid Base Matter for XI grade of Senior High School. doi: 10.2991/SNK-19.2019.41

Bukian, IGAMWP, Gading, IK, & Bayu, GW 2024. Modernizing Education: Empowering the Potential of E-Comic Media for Improved Learning Interest and Learning Outcomes. Journal of Pedagogy and Learning, 7(1), 1–13. https://doi.org/10.23887/jp2.v7i1.75823

Cahyani, VP, Fadly, D., Islawati, I., & Ahmad, F. (2024). THE ATTITUDE OF CHEMISTRY EDUCATION STUDENTS TO SOCIO-SCIENTIFIC ISSUES (SSI) IN CHEMISTRY LEARNING. INSECTA: Integrative Science Education and Teaching Activity Journal, 5(2), 212-223.

Cotiangco, EN, Huraño, NJ, Sodoso, ER, Sumagang, MG, Jumao-as, JJ, Canoy, J., Picardal, MT, & Sanchez, JMP 2024. Android-based Audio-Visual Comics in Enhancing Conceptual Understanding and Motivation of Chemistry Concepts. Orbital: The Electronic Journal of Chemistry, 125–135. https://doi.org/10.17807/orbital.v16i2.19953

Dahlan, RR, Sugiarti, S., & Hasri, H. 2023. The Effect of Discovery Learning Model on Critical Thinking Skills and Redox Learning Outcomes of Students of SMAN 2 Buru. Chemistry Education Review (CER).

Daryanto. 2013. Learning Media. Yogyakarta: Gava Media.

Islawati, I., & Samsuddin, YB (2024). Literature Review: Implementation of PjBL on Students' Creativity and Higher-Order Thinking. Indo-MathEdu Intellectuals Journal, 5(6), 7530-7540.

Islawati, I., Fadly, D., & Ahmad, F. (2024). The Effect of Problem-Based Learning (PBL) Model on Chemistry Students' Critical Thinking Skills. Venn: Journal of Sustainable Innovation on Education, Mathematics and Natural Sciences, 3(2), 59-65.

Islawati, I., & Samsuddin, YB (2024). Effectiveness of PjBL Model on Students' Collaboration Skills in Research Statistics Lectures. Indo-MathEdu Intellectuals Journal, 5(6), 7546-7557.

Islawati, I., & Munawwarah, M. (2024). Overview of Student Understanding in Research Statistics Lectures Using the PJBL Method. Journal of Teacher Studies and Learning, 7(3), 1222-1234.

Islawati, I., & Samsuddin, YB (2025). Improving Teacher Dignity: Strategies for Recognizing and Rewarding the Teaching Profession in the Digital Era. Indo-MathEdu Intellectuals Journal, 6(1), 670-679.

Islawati, I., Samsuddin, YB, & Sugiarti, S. (2025). Strategies for Developing Teacher Professionalism in the Digital Era to Face the Challenges of Gen Z Learning. Indo-MathEdu Intellectuals Journal, 6(1), 635-645.

Istiqomah, I. 2022. Application of discovery learning model with small-scale chemistry media to improve student activity and learning outcomes in class XI IPA SMAN 1 Talun. Journal of Sociology and Humanities Education, 13(2):652-652. doi: 10.26418/j-psh.v13i2.58014

Kemendikbudristek. 2022. Learning Outcomes of Chemistry Subjects Phase E and Phase F for SMA/MA/Package C Program. Agency for Standards, Curriculum, and Education Assessment, Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, 1–13.

Marwah, S., Ramlawati & Syahrir, M. 2021. Development of Electronic Chemistry Comics on Chemical Bonding Material to Improve Motivation

and Learning Outcomes of Class X Students of SMA Negeri 14 Makassar. Chemistry Education Review (CER), 5(1), 1-11

Mukasari, N. 2023. Efforts to Improve Understanding of Hydrocarbon Chemistry Material through the Discovery Learning Model for Class XI MIPA 6 Students of SMAN 2 Kuta. Journal of Innovation in Mathematics and Science Education. E-ISSN: 2797-1031

Nafala, NM 2022. Implementation of comic media in learning to increase student learning motivation. Al-Fikru, 3(1), 114–130. https://doi.org/10.55210/al-fikru.v3i1.571

Puspananda, DR 2022. Literature Study: Comics as an Effective Learning Media. Edutama Education Journal, 9(1), 85. https://doi.org/10.30734/jpe.v9i1.1682

Putri, SRJ, Panjaitan, RGP, & Wahyuni, ES 2022. Student responses toward comics as an instructional media. Atrium Pendidikan Biologi, 7(2), 86. https://doi.org/10.24036/apb.v7i2.12504

Ramdani, R., Islawati, I., & Zubair, S. (2025). Analysis of the Influence of the Talking Stick Method in the Discovery Learning Model on Students' Conceptual and Cognitive Understanding of Redox Reactions Material. East Asian Journal of Multidisciplinary Research, 4(3), 1231-1244.

Risnawati, M., Sudrajat, A., & Rahayu, Al Hayati. 2022. Application of Discovery Learning Model to Improve Scientific Attitude and Science Learning Outcomes on Changes in the Form of Objects. Bioedusiana: Jurnal Edukasi Sebelas April (JESA) Volume 6, No.2. https://ejournal.unsap.ac.id/index.php/jesa.

Rosa, NM 2015. The Influence of Attitude on Chemistry Subjects and Self-Concept on Chemistry Learning Achievement. DOI:10.30998/FORMATIVE.V2I3.104

Safitri, I., & Nurharini, A. 2024. Differentiated Learning Assisted by Digital STRIP Comic Media Improves Elementary School Student Learning Outcomes. Journal of Education and Teaching, 57(2), 237–348. https://doi.org/10.23887/jpp.v57i2.79914

Sari, SA, & Harahap, NFA 2021. Development of Comic Based Learning on Reaction Rate for Learning to be More Interesting and Improving Student's Learning Outcomes. 9(1):151-167. doi: 10.24815/JPSI.V9I1.18852

Silalahi, MS 2010. The effect of using chemistry comic media on motivation and learning outcomes of grade XI high school students on the topic of atomic structure and periodic table of elements. UNIMED Digital

Repository.

Sundayana, R. 2016. Educational Research Statistics. Bandung: Alphabeta

Suparmi, S., Rahmawati, P., Widakdo, R., Gusparenady, RC, & Fathina, RA (2024). The role of comic books in increasing students' learning motivation. https://doi.org/10.53977/ps.v4i01.1684

Suri, DA, Astuti, IAD, Bhakti, YB, & Sumarni, RA 2021. E-Comics as an interactive learning media on static fluid concepts. In 2nd Annual Conference on Social Science and Humanities (ANCOSH 2020) (pp. 358-361). Atlantis Press.

Topkaya, Y., Batdi, V., Burak, D., & Özkaya, A. 2023. The Effectiveness of Using Comics in Education: A Meta-analytic and Meta-thematic Analysis Study. Necmettin Erbakan Üniversitesi Ahmet Keleşoğlu Eğitim Fakültesi Dergisi. https://doi.org/10.38151/akef.2023.92

Ubaidillah, M. 2017. Effectiveness of Using E-Comic Learning Media in Improving Student Learning Outcomes in Fiqh Subjects (Experimental Study of Class VIII Students of Kyah Hayim Tenggilis Middle School, Surabaya). January 2, 2024. Sunan Ampel State Islamic University, Surabaya.https://www.scribd.com/document/600946099/M-Ubaidillah-D01213025

Widyawati, A., & Wijayanti, A. 2019. The influence of character-based science comic media on reading interest and learning outcomes of science education students. 5(1).https://doi.org/10.30738/SOSIO.V5I1.3075

Yunus, M., Islawati, I., Febrianti, N., & Sugiarti, S. (2024). The Correlation Between the Implementation of Chemistry Learning and Student Learning Outcomes Using a Google Classroom-Based Blended Learning Model. Journal of Educational Analytics, 3(3), 447-456.