Unnes.J.Biol.Educ. 14 (1) (2025)

Journal of Biology Education

http://journal.unnes.ac.id/sju/index.php/ujbe

The Effects of Using Digital Comic Media On The Excretory System On Students' Digital Literacy and Elaboration Abilities

Rizky Himayanti, Wiwi Isnaeni[1]✉

[1]Biology Department, FMIPA, Semarang State University, Indonesia

Article Info

Article History:

Received : July 2024

Accepted : December 2024

Published : April 2025

Keywords:

digital comics, digital literacy, elaboration ability, excretory system

Abstract

Media is one of the important things needed in learning. The use of learning media in the form of digital comics integrated with PBL is one embodiment of biology learning that is in line with current developments, namely combining science and technology. Digital comics can provide a fun learning experience for students because they are not too difficult to absorb the lesson material. The aim of this research is to determine the effect of digital comic media on excretion system material on students' elaboration and digital literacy abilities. The subjects of this research were students from classes XI-1 to XI-3 at SMA N 1 Mijen Demak. 3 classes were used with 2 classes divided as the experimental group and 1 class as the control group with the number of students XI-1 (34 students), XI-2 (33 students), and XI-3 (34 students). This research was carried out using a quasi-experimental method by giving written tests before and after the research to the experimental and control groups. The instruments used to collect data were questions, LKPD, observation sheets on learning implementation and student activities. Each instrument is used to collect data on students' elaboration abilities (question sheets) and digital literacy (observation sheets and LKPD). This research was analyzed quantitatively (T-test and N-gain) and analyzed qualitatively (observation). The results showed that the experimental class had higher elaboration and digital literacy abilities than the control class. The conclusion of this research is that media digital comics with excretory system material can improve students' elaboration and digital literacy skills and provide new experiences in the biology learning process in the classroom.

✉Correspondence Address:
D6 Building 1st Floor Jl Raya Sekaran Gunungpati Semarang
E-mail: wiwiisna@mail.unnes.ac.id

p-ISSN 2252-6579
e-ISSN 2540-833X

INTRODUCTION

Education is one of the important things for humans to have, which is a right that every citizen has. Biology itself is a branch of science that cannot be separated from problem solving activities and can direct students to combine cognitive and mental abilities to find ideas in solving problems (Zahra et al., 2021). Basically humans as living creatures have two essential elements, namely body and soul, with biology humans can gain knowledge about the activities of their body and mind (Babutta, 2020). One of the materials studied in high school biology is the excretory system. In the independent curriculum, this material can be found in phase F. The excretory system is material that studies organs and the process of eliminating metabolic waste substances by the body. This excretory system material discusses organs and the bioprocesses that occur in them. The organs discussed include the lungs, kidneys, liver and skin, while the bioprocesses discussed include the mechanism of urine formation. The teaching materials used are textbooks in the form of textbooks. Several things that are priorities for professional development are mastery of material, technology-based teaching skills, student management and involvement and increasing students' literacy and critical thinking skills (Siregar et al., 2024).

The use of digital comics in excretory system material in learning is one creative idea to provide a fun learning experience for students. Digital comics themselves are a creative media development that combines various fields such as art, language, technology and science, in this case biology. According to research, digital comics, apart from creating a pleasant learning atmosphere, can also increase student learning motivation which has an impact on increasing student learning outcomes. This happens because digital comics can provide visual and text harmonization to facilitate students in studying abstract concepts (Kaba et al. ., 2020). The use of digital comics for this excretory system is integrated with the PBL learning model. This learning model is commonly used for health education (Gonzalez-Argote & Castillo-González, 2024).

Digital literacy is an activity that is related to a person's skills in using computer science and internet technology to achieve results from an activity (Yusuf et al., 2019). Digital literacy skills emerged due to advances in information technology and the internet so that the availability of information in digital form is very abundant and can function in helping students to think critically in dealing with the information obtained so that they are not easily carried away by hoaxes or misleading information (Syarofatin et al., 2022). Digital literacy can be interpreted as a person's ability to receive and respond to information obtained from digital media that is related to everyday life. Whether or not someone is capable of digital literacy can be measured from several indicators. According to (Gilster, 1997) there are four digital literacy competencies, namely:

1. Internet searching
2. Hypertextual navigation
3. Content evaluation
4. Knowledge assembly.

Elaboration theory is a theory about learning design which is based on the opinion that a lesson must be organized from simple material to more complex material by developing students' understanding to be more meaningful and can become an integrated collection of ideas (Rohman, 2019). According to elaboration theory, at the beginning of learning a simple assignment can be presented and then a more complex assignment can be given so that students have to recall the knowledge they have previously acquired (Mahyudin & Analissan, 2023). Problems in science learning usually occur when there is difficulty understanding abstract scientific concepts, with this elaboration students can have a summary because at the end of the elaboration stage students are expected to be able to construct concepts from the material being studied (Surayanah & Karma, 2023). According to Sinar (2021), elaboration is a series of learning activities where students can take tests or conclude a concept from the material being studied as a result of the exploration that students have carried out. The learning activities in question can be carried out through the following steps:

1. Take a test
2. Make conclusions
3. Determine the formula to explore a problem

4. Explain the pattern of relationships between variables or between concepts from the material being studied

RESEARCH METHOD

The method used is quasi-experimental using three classes, namely XI-3 as the control class, XI-1 and XI-2 as the experimental class. Data collection on students' elaboration abilities was carried out quantitatively, namely using test questions. Obtaining data on digital literacy skills was carried out qualitatively (observation) and quantitatively (work on LKPD). Data on elaboration ability were analyzed using the independent T-test and N-Gain..

RESULTS AND DISCUSSION

The discussion of the results of this research is divided into 2, namely 1) the influence of using the excretion system digital comic media on students' elaboration abilities and 2) the influence of using the excretion system digital comic media on students' digital literacy abilities.

The Effect of Using Excretory System Digital Comic Media on Students' Elaboration Ability

Before the treatment was carried out, the elaboration abilities of control class and experimental class students were in the low and very low categories. After the treatment was carried out by providing digital comic media as an excretion system, there was an increase in the quality of students' elaboration abilities. Control class students did not experience significant improvement while the experimental class was in the low to very high category.

Table 1. Categories of Student Elaboration Abilit

Category student's elaboration	Before teratment (%)		After treatment (%)	
	Control	Experiment	Control	Experiment
Very high	0	0	0	28.3
High	0	0	0	49.2
Low	29.4	67.1	47	22.3
Very low	70.5	32.8	53	0

Table 2. Students' elaboration abilities based on indicators

No.	Indicators of student's elaboration	Before teratment (%)		After treatment (%)	
		Control	Experiment	Control	Experiment
1.	Do test question	35.2	83.6	100	95.5
2.	Conclude	0	0	14.7	53.7
3.	Formula for problem solving	23.5	32.8	88.2	91
4.	Explain te pattern connection	2.9	4.5	38.2	44.8

From the data it can be seen that in the control group the greatest improvement was in the stages of

working on test questions and determining formulas for solving problems. In the experimental group the biggest improvement was in the stage of determining the formula for solving the problem. The ability to conclude and explain relationship patterns in both control and experimental class students is classified as poorly mastered.

It can be seen that the ability to conclude and look for relationship patterns is the aspect that has the lowest percentage. This shows that both aspects require perseverance in understanding the existing problems. The activity of concluding is relatively low because in concluding students must correctly understand every concept of knowledge they have and must be accompanied by combining all the information that has been obtained in the exploration stage. This is supported by research (Nurdianti, 2020) where it is said that one of the reasons students have low inferential abilities is because students do not really master the learning they are doing so that students' inferential abilities are only at the level of concluding a simple concept. Apart from inferring, a low skill is connecting the pattern of a relationship. To understand the relationship patterns between two or more aspects, students are required to have high-level thinking skills and a lot of information. High level thinking skills also need to be habituated by teachers during learning. When students cannot answer a question well, it does not mean that the student does not understand the meaning of the question, but because the student is not yet familiar with HOTS type questions (Saraswati & Agustika, 2020) where HOTS questions are usually presented in the form of questions with a level of reasoning. high (Purwasi & Fitiyana, 2020).

The Influence of Digital Comics on Digital Literacy abilities

This digital literacy ability was analyzed using observations during classroom learning activities and LKPD questions that students had worked on in groups.

Table 3. Group Digital Literacy Capabilities Based on observations

Indicator of digital literacy	Students activity		
	XI-1	XI-2	XI-3
hypertext	3	3	2
internet searching	3	3	3
content evaluation	3	2	2
knowledge assembly	3	3	2
Total	12	11	9
Presentace	100%	91.7%	75%

It can be seen that based on observations during learning activities, the digital literacy abilities of students in classes XI-1 and XI-2 are almost the same, while those of students in class XI-3 are lower. This can mean that the digital literacy skills of students in the experimental class are better when compared to the control class.

The LKPD carried out by students in groups has been designed according to indicators of digital literacy skills.

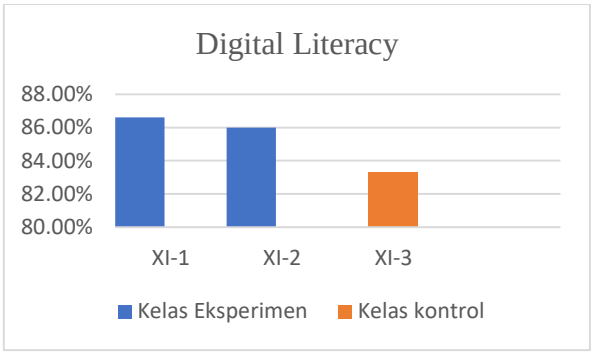

Figure 1. Student Elaboration Ability in Groups Based on LKPD

It can be seen that there is no big difference in the digital literacy abilities of students in classes XI-1 and XI-2 as a group as an experimental class. Group digital literacy abilities in the experimental class were higher compared to the control class.

Based on existing data, the level of digital literacy skills in experimental classes 1 and 2 is not much different, whereas in the control class digital literacy skills are lower. This can also be seen in the diagram where it is known that the observation assessment and LKPD have the same results, namely there is no significant difference between the 2 experimental classes and the control class's literacy skills are lower when compared to the experimental class. Regarding internet searching skills or searching for information on the internet, all students from both the control and experimental groups were classified as good because during the research all students had the means to use the internet. Apart from that, in discussions students can find new information via the internet.

The use of digital comics as a learning medium has a positive effect on students' elaboration and digital literacy abilities. Digital comics can build student enthusiasm in learning activities because they present material in visual media, not just text (Pujiwisata & Susila, 2020). This excretion system digital comic can also significantly improve learning outcomes such as increasing student involvement in learning, learning motivation, thinking skills, and has a positive impact on student academic achievement because it can be used independently by students (Khotimah & Hidayat, 2022). The use of comic media can help teachers to present information by telling stories but not verbally.

CONCLUSION

The conclusion of this research is that the use of digital comic media, an excretory system, can improve students' digital literacy and elaboration abilities.

REFERENCES

Babutta, S. L. (2020). Memaknai Manusia Dalam Dimensi Mahkluk Hidup: Kajian Filosofis Dari Sudut Pandang Biologi. *Jurnal Filsafat Indonesia*, *3*(2), 48–53.

Kaba, G., Şin, M., Türkİye, İ., & Roman, D. Ç. (2020). *Eğitimde Dijital Çizgi Roman Tasarımı : Etkin Vatandaş Bilge * Araştırma Makalesi Digital Comics Design in Education : Active Citizen , Bilge*. 107–123.

Kaba, G., Şin, M., Türkİye, İ., & Roman, D. Ç. (2020). *Eğitimde Dijital Çizgi Roman Tasarımı : Etkin Vatandaş Bilge * Araştırma Makalesi Digital Comics Design in Education : Active Citizen , Bilge*. 107–123.

Khotimah, H., & Hidayat, N. (2022). Interactive Digital Comic Teaching Materials to Increase Student Engagement and Learning Outcomes. *International Journal of Elementary Education*, *6*(2), 245–258.

Gilster, Paul. (1997). Digital Literacy. Canada: Jphn Wiley & Sons, Inc.

Mahyudin, E., Alihsan, D., A. (2023). Penerapan Strategi pembelajaran Elaborasi Untuk Peningkatan Penguasaan Mufradat di Madrasah Tsanawiyah. J*urnal Kalamuna*, 4(1), 59-77.

Nurdianti, R. (2020). Penerapan Metode Edutainment Berbasis Guided Discovery Learning (GDL) untuk Meningkatkan Keterampilan Menyimpulkan pada Pembelajaran IPA. *Didaktika Dwija Indria*, *8*(4).

Pujilestari, Y., & Susila, A. (2020). Pemanfaatan Media Visual dalam Pembelajaran Pendidikan Pancasila dan Kewarganegaraan. *Jurnal Ilmiah Mimbar Demokrasi*, *19*(02), 40–47.

Rohman, F. (2019). Teori Belajar Elaborasi (Suatu Strategi Pembelajaran). Ju*rnal Al-Hadi*, 5(1), 996-1010.

Saraswati, P. M. S., & Agustika, G. N. S. (2020). Kemampuan Berpikir Tingkat Tinggi Dalam Menyelesaikan Soal HOTS Mata Pelajaran Matematika. *Jurnal Ilmiah Sekolah Dasar*, *4*(2), 257.

Sinar, M., A. (2021). Peran Pengawas di Era Global Terobosan Baru Meningkatkan Profesionalitas Guru. Yogyakarta.

Siregar, H. D., Wassalwa, M., Janani, K., Harahap, I. S., Gusti, I., & Ari, A. (2024). *Al itihadu jurnal pendidikan*. *3*(1).

Surayanah, S., & Karma, L. (2023). Mengembangkan Higher Order Thinking Skills dan Prestasi Belajar melalui Elaborasi Nilai-Nilai Kearifan Lokal dalam Pembelajaran Sains. *JIIP - Jurnal Ilmiah Ilmu Pendidikan*, *6*(5), 3469–3481.

Syarofatin, R. H., Isnaeni, W., & Alimah, S. (2022). Android Based Module Development with Project-Based Learning Model on Immune System Materials to Improve Critical Thinking and Digital Literature Skills. *Jise*, *11*(3), 321–331.

Yusuf, R., Sanusi, Maimun, Hayati, E., & Fajri, I. (2019). Meningkatkan Literasi Digital Siswa Sekolah Menengah Atas Melalui Model Project Citizen. *Prosiding Seminar Nasional Reaktualisasi Konsep Kewarganegaraan Indonesia*, 185–199.

Zahra, P., Gresinta, E., & Pratiwi, R. H. (2021). Pengaruh Kecerdasan Intrapersonal Terhadap Kemampuan Pemecahan Masalah pada Mata Pelajaran Biologi. *EduBiologia: Biological Science and Education Journal*, *1*(1), 48.