The Effectiveness of the Padlet-Assisted RICOSRE-Station Rotation in Promoting Students' Digital Literacy

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Abstract. Students need digital literacy as an essential skill to effectively navigate the challenges of the digital age. This study sought to investigate the effectiveness of the Padlet-assisted RICOSRE-station rotation learning model on high school students' digital literacy in biology learning. This study employed a pretest-posttest non-equivalent control group design. The independent variables in this study consisted of the Padlet-assisted RICOSRE-station rotation learning model, RICOSRE, and conventional learning. The dependent variable was students' digital literacy. The study's population comprised all tenth-grade students from SMAN 11 Makassar, located in South Sulawesi, Indonesia. A random sampling procedure was done to select three groups of participants. The experimental group was taught using the Padlet-assisted RICOSRE-station rotation, the positive control group learned using RICOSRE, and the negative control group was engaged in conventional learning. The pretest and post-test data were gathered using a digital literacy questionnaire. The questionnaire used a five-point Likert scale: strongly disagree, disagree, neutral, agree, and strongly agree. The research data were analyzed using One-Way ANCOVA and the LSD test. The results revealed that the Padlet-assisted RICOSRE-station rotation model was effective in empowering high school students' digital literacy in biology learning, where the experimental group achieved the highest mean score among all intervention groups (77.757). The RICOSRE and conventional groups achieved lower mean score on digital literacy, which were 65.681 and 58.515, respectively.

Keywords: Digital literacy, RICOSRE-station rotation, Padlet.

1 Introduction

To thrive in the Society 5.0 era, students need to acquire the 21st century skills. Society 5.0, characterized by digital transition, necessitates societal preparedness to confront diverse life difficulties [1]. Digital literacy is a crucial skill that can enable pupils to effectively navigate the problems posed by the digital age [2].

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Digital literacy refers to the capacity to utilize digital technology to locate, manipulate, comprehend, assess, and scrutinize information [3]. Students require digital literacy to effectively choose, manipulate, and comprehend information obtained from diverse online sources [4]. When studying biology, students need digital literacy to elucidate concepts, surmount obstacles related to perception, time, and space, transcend the constraints imposed by changes in organisms and the environment that are observable. Digital literacy in the biology classroom helps foster a shared understanding among students [5].

According to the findings of the *KOMINFO* survey conducted in 2022, the level of digital literacy among students in Indonesia fell within the medium range, with a proportion of 70.8% [6]. A preliminary study indicated that Indonesian students showed poor performance in digital literacy (with 37.68% accomplishment of the indicators). Previous research showed that students' poor digital literacy resulted from their inadequate capacity to analyze and evaluate information presented in digital media [7]. The restricted deployment of digital learning methods and online platforms has contributed to the low digital literacy of students, hence limiting their access to information sources [8]. The study findings suggest that there is a pressing need for innovative learning strategies to enhance pupils' digital literacy.

It has been shown that RICOSRE (reading, identifying the problem, constructing the solution, solving the problem, reviewing the solution, dan extending the solution) can promote students' digital literacy [9]. RICOSRE is an instructional approach that encourages students to actively engage in identifying problems, solving problems, and finding solutions to solve a problem [10]. During the problem-solving process, students need technology to aid their search for diverse information on the internet [11].

Implementing RICOSRE in the biology classroom can enhance students' conceptual comprehension as the instructional approach commences with reading exercises [12]. Although RICOSRE provides advantages for problem-solving learning, its implementation in the classroom has not fully utilized digital technologies. During the RICOSRE reading stage, students mostly rely on printed reading materials and tend to utilize internet-based learning resources in many forms less frequently. In fact, the *Reading* phases in RICOSRE can incorporate digital media to engage pupils in various reading activities [13].

The integration of the RICOSRE model with station-rotation can enhance and address the limitations of the RICOSRE model, as mentioned above. Station-rotation is an educational approach that utilizes a blended learning paradigm to allocate learning activities according to the specific requirements of both students and teachers [14]. Blended learning has a positive impact on students' digital literacy [15]. The station-rotation model allows students to utilize online platforms as both learning places and resources.

Padlet is a web-based platform that facilitates digital learning. Padlet facilitates the exchange of ideas and information among teachers and students. Padlet is an online platform that allows users to share information with each other through file uploads

and comments [16]. Students can utilize the Padlet platform to exchange virtual notes regarding their comprehension of the learning material, facilitating a collective and cohesive knowledge among all students [17].

The integration of RICOSRE with the station rotation model is applicable in biology classes. The problem that has been found in schools in the context of biological material is that the learning process does not utilize digital technology. During the biology learning process, students will be faced with several complex and abstract materials.

Abstract material cannot be presented verbally, but also needs to be presented visually through the use of digital technology [18]. Material that is classified as complex and abstract can be presented in digital media in the form of learning videos, because the video can concretize a message [19]. In the current research, we implemented the model in a biology classroom studying the diversity of living things and viruses. Many challenges in life can be associated with the sustenance of organisms and the presence of viruses.

Therefore, the objective of the study was to examine the effectiveness of the Padlet-assisted RICOSRE-station rotation learning model on high school students' digital literacy in biology learning. This research contributes to empowering students' 21st century skills, one of which is digital literacy which is very beneficial for human life in the digital era.

2 Method

2.1 **Research Design**

The present study utilized a pretest-posttest non-equivalent control group design. The independent variables in this study consisted of the Padlet-assisted RICOSRE-station rotation learning model, RICOSRE, and conventional learning. The dependent variable was students' digital literacy. Table 1 presents the design of the current study.

Table 1. Research design

Group	*Pre-test*	Intervention	*Post-Test*
Padlet-assisted RICOSRE-station rotation	O_1	X_1	O_2
RICOSRE	O_3	X_2	O_4
Conventional	O_5	X_3	O_6

Source: [20]

Description:
O_1, O_3, and O_5 = *pre-test* scores on digital literacy
O_2, O_4, and O_6 = *post-test* scores on digital literacy
X_1 = experimental group (Padlet-assisted RICOSRE-station rotation)
X_2 = positive control group (RICOSRE)
X_3 = negative control group (conventional)

2.2 Research Population and Sample

The study's population included all class X at SMAN 11 Makassar, South Sulawesi, Indonesia, which consists of 10 classes. The classes used have gone through an equality test. All class X at SMAN 11 Makassar were declared equal. Three group of individuals were selected using a random sampling technique. The experimental group received instruction through the Padlet-assisted RICOSRE-station rotation model, the positive control group was taught using RICOSRE alone, and the negative control group
followed conventional learning methods. The total number of students in the three classes used as research samples was 108 students.

2.3 Research Procedures

The experimental, positive control, and negative control groups were subjected to distinct instructional models regarding the diversity of living organisms and viruses. Figure 1 shows the learning stages in three different learning activities, namely the Padlet-assisted RICOSRE-station rotation model, the RICOSRE model, and conventional learning.

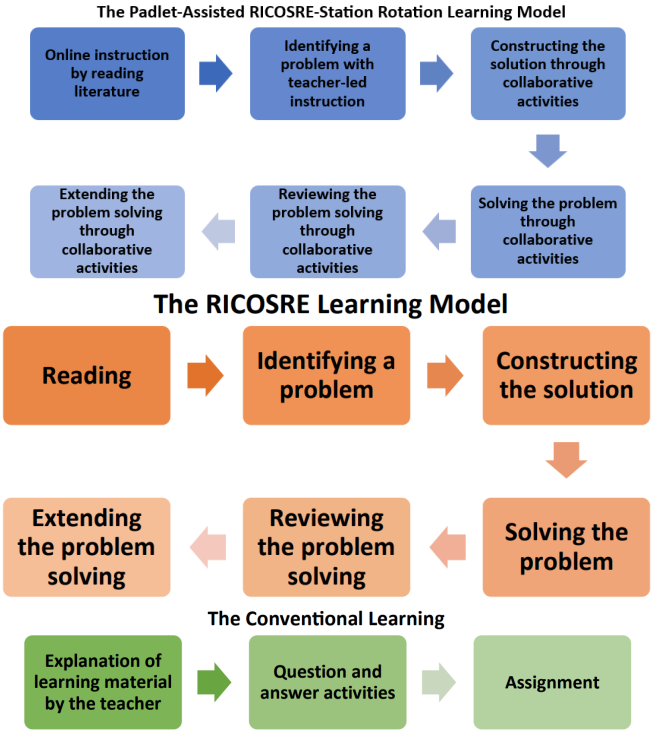

Fig. 1. Educational Activities

2.4 Research Instrument

The research data were gathered using a digital literacy questionnaire. The questionnaire consisted of 24 closed-ended statements presented using a five-point Likert scale: strongly disagree, disagree, neutral, agree, and strongly agree. Before it was used to collect the data, the questionnaire had undergone construct and content validity tests by experts. An empirical test was also done to measure the validity and reliability of the instrument. The validity of the questionnaire item was assessed using the Pearson product moment correlation test. The calculated correlation coefficient
(r value) ranged from 0.247 to 0.658, while the critical value (r table) was determined to be 0.355. Therefore, a total of 24 instrument items were deemed valid, while only 1 instrument item was deemed invalid. The Cronbach's alpha reliability test demonstrated that all 24 items of the instrument were reliable, with a remarkably high reliability score of 0.846. The items of the digital literacy questionnaire were constructed based on the six indicators outlined in Table 2.

Table 2. Digital Literacy Indicators

Indicator	Description
Finds	Students are able to search and sort information related to problems independently.
Use multiple sources	Students are skilled at using information sources in various forms, such as video, text, images, music, etc.
Selects	Students are able to choose sources of information and retrieve information that is relevant to their goals.
Evaluates	Students are able to authenticate authors and sources of information, as well as identify bias in data/information.
Considers source, message effect	Students realize that information may have biases that can influence decisions.
Uses to produce original work	Students use analytical and evaluative skills to harness digital information to create a work/product.

Source: [3]

2.5 Data Collection and Data Analysis

Responses provided by students on the digital literacy questionnaire were evaluated using a five-point Likert scale. A One-Way ANCOVA test was conducted for hypothesis testing with a significance level of 5%. The research hypothesis was the Padlet-assisted RICOSRE-station rotation model was effective in empowering high school students' digital literacy in biology learning. The ANCOVA test was only applied to data that followed a normal distribution. The One-sample Kolmogorov-Smirnov test was employed to assess the normality of the data, while Levene's test of equality of error variance was used to examine the homogeneity of the data. Following the completion of the ANCOVA test, the data underwent additional testing using the LSD test.

3 Results

The results of the assumption test in Table 3 indicated that the p-values for normality and homogeneity were both greater than 0.05, suggesting that the data followed a normal distribution and were homogeneous. Table 4 displays the results of the one-way ANCOVA analysis of students' digital literacy.

Table 3. Results of the normality and homogeneity tests

Test		N	*P*	α	Ket.
Pre-Test	Normality	108	0.074	0.05	Normal
Post-Test	Normality	108	0.060	0.05	Normal
Post-Test	Homogeneity	108	0.438	0.05	Homogeneous

Table 4. Results of the One-Way ANCOVA

Source	Type III sum of squares	Df	Mean square	F	Sig.
Corrected model	6380.634[a]	3	2126.878	75.594	.000
Intercept	1656.778	1	1656.778	58.885	.000
Pretest	75.641	1	75.641	2.688	.104
Model	6185.702	2	3092.851	109.926	.000
Error	2926.109	104	28.136		
Total	502283.956	108			
Corrected total	9306.743	107			

Table 4 shows an Fcalculated of 109.926 with a significance value of 0.000 (P-value < 0.05). Therefore, it was concluded that there were differences in the digital literacy of students who were taught using the Padlet-assisted RICOSRE-station rotation model, the RICOSRE model, and conventional learning. The corrected mean and LSD test
results on students' digital literacy in each learning model can be seen in Table 5.

Table 5. The LSD test results

Learning model	Mean	LSD notation		
Padlet-Assisted RICOSRE-station-rotation	77.757	a		
RICOSRE	65.681		b	
Conventional	58.515			c

According to Table 5, the mean score achieved by the Padlet-assisted RICOSRE-station rotation group (77.757) differed significantly from that obtained by the RICOSRE (65.681) or conventional (58.515) group. The results revealed that the Padlet-assisted RICOSRE-station rotation model was effective in empowering high school students' digital literacy in biology learning. A visual display of the use of the Padlet in this research as supporting evidence can be seen in the figure 2.

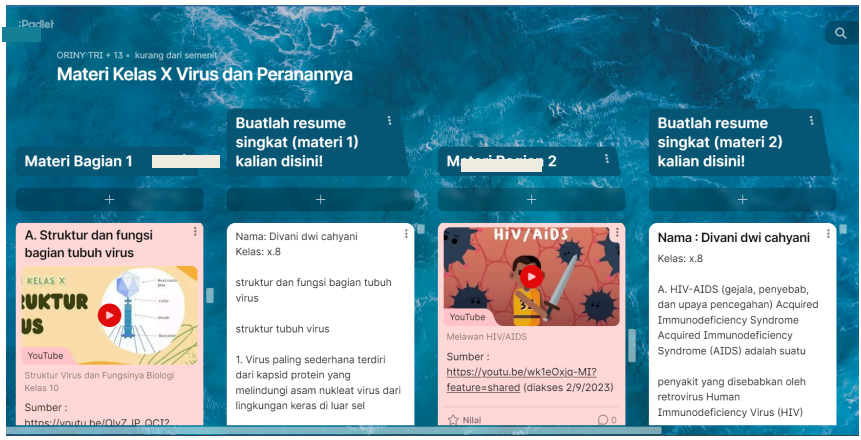

Fig. 2. A visual display of the padlet in biology learning

4 Discussion

The RICOSRE-station rotation model with Padlet assistance has the potential to improve students' digital literacy. The Padlet-assisted RICOSRE-station rotation model is a problem-based learning model that combines blended learning. With blended learning, students can use digital devices as a learning space that can help them become more digitally literate [15].

In the Padlet-assisted RICOSRE-station rotation classroom, online instruction began with literature reading. At this stage, students had a responsibility to engage with reading materials that pertain to what they are studying in the biology classroom. During this phase, pupils also engaged in the study of biology-related texts and instructional videos hosted on the Padlet platform. The integration of instructional videos into the learning environment enhances student engagement and comprehension [21]. Digital literacy among pupils may be enhanced by incorporating digital devices into the learning process [22].

In the second phase of the RICOSRE-station rotation model aided by Padlet, students identified problems associated with the diversity of biological organisms and viruses with teacher-led instruction. The students then concentrated on contextual and complex problems under the guidance or instruction of the teacher. The teacher-led instruction can improve the ability of students to concentrate on issues, pose inquiries, and receive constructive feedback on an individual basis [23].

Following the second phase, the students were encouraged to develop the solutions to the problems in groups through collaborative exercises. Students were involved in collaborative idea exchange with their peers as they formulated problem-solving strategies pertaining to the wide variety of living organisms and viruses. Collaborative problem-solving among students will provide them with a foundation for critical thinking through the exchange of ideas and decision-making processes [24].

The fourth phase consisted of collaborative problem-solving activities. In small groups, students collected data to address challenges pertaining to the diversity of viruses and living organisms, utilizing the solution strategies they had identified. They determined which implementation strategies were the most efficient. Students' digital literacy can be enhanced through the process of categorizing accurate and pertinent information they find while searching the internet [25]. The information management activities that students performed during the second, third, and fourth learning stages—such as analyzing, synthesizing, evaluating, and implementing information to solve problems—might lead to their increased digital literacy [26].

The fifth stage involved reviewing the solutions through collaborative activities. To advance the body of knowledge, pupils presented the solutions to the problems in a collaborative manner. Collaboration and communication are considered fundamental digital competencies [27]. At this stage, students evaluated the precision of the problem-solving methodologies employed. After that, students extended their problem-solving results through collaborative activities. They employed the solutions they obtained in the previous stage to address additional problems. Students are instructed in the cultivation of sensitivity when it comes to the analysis of commonplace issues [28]. In the digital age, every individual is expected to possess the capability to operate digital devices and resolve a variety of real-world issues.

The utilization of the Padlet-assisted RICOSRE-station rotation model in the biology classroom offers numerous benefits. First, students are allowed to possess significant autonomy in managing their learning process, thereby ensuring their active engagement in the learning process. Furthermore, students can conveniently retrieve literature and engage in the exchange of ideas at any given time and location. Besides that, the separation between online-based individual learning activities and offline collaboration activities is more concentrated, resulting in a conducive learning environment. Padlet is accessible through both its application and website, facilitating usage for students with devices that have restricted storage capacity.

5 Conclusion

The results of the current study showed that there were differences in the digital literacy of students who were taught using the Padlet-assisted RICOSRE-station rotation model, the RICOSRE model, and conventional learning. In this study, the group who utilized the Padlet-assisted RICOSRE-station rotation model demonstrated the highest mean score (77.757) on digital literacy among all intervention groups (RICOSRE and conventional). These findings suggest that the Padlet-assisted RICOSRE-station rotation model was effective in empowering high school students' digital literacy in biology learning. The limitation of this research was that the application of the Padlet-assisted RICOSRE-station rotation model only measured students' digital literacy, so further research needs to be carried out regarding the RICOSRE-station rotation model which has the potential to empower various other 21st century skills.

6 Authors' Contributions

Each author has made significant contributions to current research and article writing.

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References

1. A. G. Pereira, T. M. Lima, and F. C. Santos, "Industry 4.0 and Society 5.0: Opportunities and Threats," *International Journal of Recent Technology and Engineering (IJRTE)*, vol. 8, no. 5, pp. 3305–3308, 2020, doi: 10.35940/ijrte.D8764.018520.
2. E. Van Laar, A. J. A. M. Deursen, J. A. G. M. Dijk, and J. De Haan, "The relation between 21-st century skills and digital skills or literacy: A systematic literature review," 2017, doi: 10.1016/j.chb.2017.03.010.
3. L. Greenstein, *Assessing 21st Century Skills: A Guide to Evaluating Mastery and Authentic Learning*. United States of America: Corwin Press, 2012.
4. S. Patmanthara and W. N. Hidayat, "Improving Vocational High School Students Digital Literacy Skill through Blended Learning Model," *Journal of Physics: Conf. Series*, vol. 1028, p. 012076, 2018, doi: 10.1088/1742-6596/1028/1/012076.
5. M. A. Jamil, S. Fuadiyah, Helendra, and R. Darussyamsu, "Analisis Deskriptif Tingkat Kemampuan Literasi Digital pada Pembelajaran Biologi," *Journal on Teacher Education*, vol. 4, no. 2, pp. 640–648, 2022, doi: 10.31004/jote.v4i2.8785.
6. Kominfo, "Status Literasi Digital di Indonesia 2022," 2022. Accessed: Feb. 11, 2023. [Online]. Available: https://web.kominfo.go.id/sites/default/files/ReportSurveiStatusLiterasiDigitalIndonesia2022.pdf
7. A. M. Yusuf, S. Hidayatullah, and D. Tauhidah, "Hubungan Literasi Digital dan Saintifik dengan Hasil Belajar Kognitif Biologi Siswa SMA," *Assimilation: Indonesian Journal of Biology Education*, vol. 5, no. 1, pp. 8–16, 2022, doi: 10.17509/aijbe.v5i1.43322.
8. T. Rahayu and T. Mayasari, "Profil kemampuan awal literasi digital dalam pembelajaran fisika siswa SMK Kota Madiun," in *Seminar Nasional Quantum*, 2018, pp. 431–437.
9. D. Setiawan, S. Mahanal, and S. Zubaidah, "RICOSRE: Effect and potential to enhance biology students' digital literacy at Universitas Negeri Malang," in *AIP Conference Proceedings 2330*, AIP Publishing, 2021, p. 030041. doi: 10.1063/5.0043139.
10. S. Mahanal and S. Zubaidah, "Model Pembelajaran RICOSRE yang Berpotensi Memberdayakan Keterampilan Berpikir Kreatif," *Jurnal Pendidikan*, vol. 2, no. 5, pp. 676–685, 2017.
11. E. Y. Wijaya, D. A. Sudjimat, and A. Nyoto, "Transformasi Pendidikan Abad 21 sebagai Tuntutan Pengembangan Sumber Daya Manusia di Era Global," in *Prosiding Seminar Nasional Pendidikan Matematika* , 2016, pp. 263–278.

12. N. B. Haka, L. K. Sari, A. Handoko, N. Hidayah, and H. Masya, "Model Pembelajaran RICOSREBerbantuan PodcastTerhadap Peningkatan Keterampilan Komunikasi dan Berpikir Analisis pada Mata Pelajaran Biologi Kelas XI," *Journal Hypermedia & Technology-Enhanced Learning*, vol. 1, no. 1, pp. 15–22, 2023, doi: 10.58536/j-hytel.v1i1.23.
13. N. L. Nuryani and I. B. G. S. Abadi, "Media Pembelajaran Flipbook Materi Sistem Pernapasan Manusia pada Muatan IPA Siswa Kelas V SD," *Jurnal Imiah Pendidikan dan Pembelajaran*, vol. 5, no. 2, pp. 247–254, 2021, doi: 10.23887/jipp.v5i2.
14. H. Staker and M. B. Horn, *Classifying K–12 blended learning*. Innosight Institute, 2012.
15. R. A. K. Dewi and K. Fatkhiyani, "Blended Learning: Can It Be a Solution to Improve Digital Literacy and HOTS for PGSD Students in a Pandemic Situation?," *International Journal of Elementary Education* , vol. 5, no. 4, pp. 601–611, 2021, doi: 10.23887/ijee.v5i4.39411.
16. M. A. Shuker and R. Burton, "Educational Technology Review: Bringing people and ideas together with 'Padlet,'" *Journal of Applied Learning & Teaching*, vol. 4, no. 2, pp. 121–124, 2021, doi: 10.37074/jalt.2021.4.2.9.
17. A. Rohmatika, P. Arianto, and R. M. Putra, "Studi Pendahuluan Aplikasi Padlet Pada Kelas Menulis," *Jurnal Komunikasi & Bahasa*, vol. 1, no. 2, pp. 148–162, 2020, doi: 10.53565/nivedana.v1i2.222.
18. H. Darmawan and Nawawi, "Pengembangan Media Pembelajaran Interaktif dan Lembar Kerja Siswa pada Materi Virus," *JPBIO (Jurnal Pendidikan Biologi)*, vol. 5, no. 1, pp. 27–36, 2020, doi: 10.31932/jpbio.v5i1.573.
19. W. A. D. Pamungkas and H. D. Koeswanti, "Penggunaan Media Pembelajaran Video Terhadap Hasil Belajar Siswa Sekolah Dasar," *Jurnal Ilmiah Pendidikan Profesi Guru*, vol. 4, no. 3, pp. 346–354, 2021, doi: 10.23887/jippg.v4i3.
20. P. D. Leedy and J. E. Ormrod, *Practical Research: Planning and Design Eleventh Edition*. USA: Pearson Education, 2015.
21. M. Salehudin, "Literasi Digital Media Sosial Youtube Anak Usia Dini," *Jurnal Ilmiah Potensia*, vol. 5, no. 2, pp. 106–115, 2020, doi: 10.33369/jip.5.2.%25p.
22. Z. Yu, "Sustaining Student Roles, Digital Literacy, Learning Achievements, and Motivation in Online Learning Environments during the COVID-19 Pandemic," *Sustainability*, vol. 14, no. 8, p. 4388, 2022, doi: 10.3390/su14084388.
23. C. R. Tucker, T. Wycoff, and J. T. Green, *Blended Learning in Action A Practical Guide Toward Sustainable Change*. United States of America: SAGE Publications, 2016.
24. I. Supena, A. Darmuki, and A. Hariyadi, "The Influence of 4C (Constructive, Critical, Creativity, Collaborative) Learning Model on Students' Learning Outcomes," *International Journal of Instruction*, vol. 14, no. 3, pp. 873–892, 2021, doi: 10.29333/iji.2021.14351a.
25. Z.-J. Liu, "Digital Literacy and Digital Didactics as the Basis for New Learning Models Development," *International Journal of Emerging Technology in Learning*, vol. 15, no. 14, pp. 4–18, 2020, doi: 10.3991/ijet.v15i14.14669.
26. S. Kaeophanuek, J. Na-Songkhla, and P. Nilsook, "How to Enhance Digital Literacy Skills among Information Sciences Students," *International Journal of Information and Education Technology*, vol. 8, no. 4, pp. 292–297, 2018, doi: 10.18178/ijiet.2018.8.4.1050.
27. H. Tinmaz, Y.-T. Lee, M. F. Ivanovici, and H. Baber, "A Systematic Review on Digital Literacy," *Smart Learning Environments*, vol. 9, no. 21, pp. 1–18, 2022, doi: 10.1186/s40561-022-00204-y.
28. S. Mahanal, S. Zubaidah, and D. Setiawan, "The Potential of RICOSRE to Enhance University Students' Science Literacy in Biology," in *International Conference on Biology,*

Sciences and Education (ICoBioSE 2019), Atlantis Press, 2020, pp. 282–287. doi: 10.2991/absr.k.200807.056.