

## The Effect of Flipped Class with Project Based Learning Assisted by Moodle Combined with Reading, Questioning, and Answering (RQA) on 4C Skills

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### ABSTRACT

This study was to find out the effects of flipped class with project-based learning (PjBL) dimensions assisted by Moodle combined with reading, questioning and answering (RQA) strategies on students' 21<sup>st</sup>-century skills. The research was quasi-experimental with cluster random sampling technique. The sample was three classes of twelve graders at a private school. The first class applied flipped class with project-based learning assisted by Moodle combined with RQA. The second class applied flipped class learning assisted by Moodle without PjBL and RQA. And the control class applied conventional online learning using Moodle only. Each class consists of 25 students. The instrument was an essay test with 10 questions. The collaboration and communication skills were assessed using observation sheets. The average of these two values used as a reference to determine the predicate of students' 4C ability. The normality and homogeneity tests found that the three classes were the same and normally distributed (sig.>0.05). The results of ANOVA test and student's response observation showed significant differences in three classes S1, S2 and S3 ( $\alpha = 0.05$ , sig.0.00). The first class shows the highest 4C skills results followed by the second and third treatment classes with average scores respectively 91.25; 91.52 (very competent), 83.32; 83.04 (very competent) and 73.74; 73.64 (competent). These findings were expected to be a recommendation for educators to integrate the 4C skills through flipped class to improve students' skills.

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**Keywords:** 4C skills, flipped class, project-based learning, RQA

## Introduction

Mastery of science and technology towards the 21<sup>st</sup> century is an important key to the success of a nation. The progress of a nation is a benchmark to compete globally. In 2018, Indonesia's scientific literacy ability ranked 74 from 79 countries with an average score of 396 in the assessment conducted by PISA (OECD, 2018). This is the main focus in improving literacy skills for every student, including students. Twenty-first century conditions require skills to catch up with increasingly developing technology in the global workforce. The partnership for 21<sup>st</sup>-century skills presents the 4Cs of communication, collaboration, and critical thinking skills as the main skills of learning and innovation in the 21<sup>st</sup> century (Nalantha et al., 2021).

The digitization of information and communication which develop dynamically during online learning is an opportunity as well as a challenge for the empowerment of Indonesian youth as national assets in the current 4.0 revolution era (Pudiyono, 2019). One approach that can be used as the answer of this condition is the flipped classroom model. In the flip classroom, students participate in preparing for learning through watching videos, access learning resources provided by educators through e-learning and learning management system (Pintalitna et al., 2015). In addition, teachers mostly incorporated the 4C skills in the learning activity and assessment.

Moodle as Learning Management System that contains text, animation, video, sound, to supplement and enrich the learning process. Moodle can facilitate communication and discussions in the forum. This platform offers a lot of benefits and the clearest benefits are accessibility, flexibility, and adaptability in learning process (Ventayen et al., 2018). It makes teaching and learning process can be done anywhere and anytime. This platform makes it possible to conduct teaching and learning activities flexibly. Teachers can insert 4C skills during interact with students and see students' responses by providing the right activities for students' learning in Moodle. It makes teacher knows the extent of the students' abilities. Students access Moodle content at home by giving short evaluation before learning face to face in the class. Therefore, students already have knowledge before coming to class (Ardinengtyas et al., 2021).

Digital web-based learning is related to real life as a hands-on activity. Therefore, digital literacy needs to be developed in the field of education to stimulate the development of students' knowledge by encouraging students' curiosity and creativity (Tarigan et al., 2021). Hague & Payton (2010) define digital literacy as an individual's ability to apply functional skills to digital devices so that they can develop 21<sup>st</sup> century skills known as 4C skills. In the 4C skills, students are directed to have critical, creative, communicative thinking skills and the skills to collaborate in solving problems. Not only that, computational thinking also sharpens logical, mathematical, mechanical knowledge combined with modern knowledge about technology, digitization, and computerization and even forms a character that is confident, open-minded, tolerant, sensitive to the environment and also communicate effectively. Communicative skills as well as the skills to collaborate in solving problems (Triana et al., 2020).

Preliminary observations show that the learning model in school, especially grade 12 was still oriented to cognitive learning outcomes and has not encouraged to empower students' literacy and metacognitive skills. Preliminary observations also show that less than 65% of teachers tried to empower metacognitive and critical thinking skills in learning through the active learning strategies. It resulted in low students' cognitive abilities and literacy, because they have not been trained to manage their cognitive abilities (self-assessment) and monitor their cognitive abilities (self-regulated). Corebima (2009) suggested that Reading Questioning, and Answering (RQA) can force students to read the subject matter, helps to ease the learning process, and help to achieve learning goals.

Preliminary observations also show that the average student test results in Biology subjects, especially biotechnology were 66.21 in the year of 2018/2019. Preliminary

observations also show that in semester exams, 43.13% of students have poor results. Pretest using 10 HOTS questions also show the low achievement about 53.47 points. It also observed that collaboration and communication skills had not developed. Another problem in the learning process found was character development in learning which tended to be neglected. This could be seen by the students who have not shown literate characters such as maintaining discipline, honesty and responsibility (plagiarizing a friend's assignment), creativity (thinking the new ideas), and caring for the environment.

One way to improve students' skills is by applying the flipped class strategy with Project Based Learning (PjBL) based on scientific and digital literacy. This method has the potential to empower 4C skills and develop students' literacy. It fulfills the demand to include 4C skills in the learning process.

It also expected to fulfill the demands of a curriculum that the affective domain must be integrated in science, knowledge and skills (Rahayu et al., 2021). Based on the above background, the authors took the initiative to conduct the research entitled The Effect of Flipped Class with Project Based Learning Assisted by Moodle Combined with Reading, Questioning and Answering (RQA) on 4C skills.

## Methods

This research was a quasi-experimental study with a pretest-post-test nonequivalent control group design as shown in Table 1.

Table 1. Treatment Class

Pre-Test	Treatment	Post Test
A1	S1	B1
A2	S2	B2
A3	S3	B3

Information :

S1 : flipped class with project-based learning assisted with Moodle and RQA.

S2 : flipped class assisted by Moodle without PjBL and RQA.

S3 : conventional learning class (face to face) that only uses Moodle.

A1, A2, A3 : pretest of 4C skills.

B1, B2, B3 : post-test of 4C skills.

The research population was all students of grade 12 science major in the second semester of the academic year 2021/2022 with a total class of four classes. Three classes of research samples conducted by random sampling and prerequisite test using analysis of variance (ANOVA)-normality and homogeneity for each class (Sig.>0.05). Observations were carried out for three months by observing the teaching and learning activities that the teachers did on Moodle. The data were analyzed using induction, data reduction, and trustworthiness process. The research instruments were:

a. Instrument of Independent Variable.

Observation sheet assessed teachers' and students' activities during learning in the class. Lesson plan in each class was adjusted to the treatments.

b. Instrument of Dependent Variable

The instrument to assess critical and creative thinking skills was an essay test with 10 questions and equipped with rubrics to check the answers. The indicators for critical thinking skills were providing elementary clarification, building basic support, inference, making advanced clarification, strategies and tactics (Ennis, 2011). The indicators for creative thinking skills were fluency, flexibility, originality, and elaboration (Supriadi, 1997). The test was compiled according to the revised Bloom's taxonomy which arranged by researcher and

validated by validator. The instruments for collaboration and communication skills were an observation sheet adopted from assessment that has been developed by Purnawirawan et al. (2019). The indicators for collaboration were cooperation and leadership, adapted in various roles and responsibilities, work productively with others, empathy, and respect to different perspectives. The indicators for communication were managing and creating the effective communication, efficient in writing, oral and multimedia, express their ideas with friends during discussion in the class.

Questionnaire of students’ responses about learning activities using Likert scale with four scales. Next, questionnaire scores (non-test) were converted into total value and then combined with cognitive value. The average of these two values was used as a reference to determine the predicate of students’ 4C skills. The reference for changing the score values into categorical values was adopted from previous studies which conducted by Purnawirawan et al. (2019).

Table 2. Category of Final Value Range (Cognitive and Questionnaire)

Final Value Range	Category
81-100	Very Competent
61-80	Competent
41-60	Incompetent

(Source: Purnawirawan et al., 2019)

Data analysis was started with normality and homogeneity tests (significance value is more than  $\alpha = 0.05$ ). The ANOVA with significance level of 5% was used to measure the effect of the independent variables assigned to the dependent variable.

### Results and Discussion

The results of the homogeneity and normality tests show the significance value was 0.1 with  $\alpha = 0.05$ . This shows that the samples were normally and homogeneous distributed. After the pretest was carried out, the three sample classes were given different treatments and ended with a post-test. The results show significant differences in the three classes ( $\alpha = 0.05$ , sig.0.00) in the post test. The first class (Flipped learning with Moodle, PjBL, and RQA) shows a significant effect marked by the highest 4C skills results. It followed by the second class (Flipped learning with Moodle, without PjBL and RQA) and the third class (conventional online with Moodle). The classes gain scores as follows: 91.25, 83.32 and 73.74 (see Figure 1). In the flip classroom, students prepare themselves through watching videos, reading and questioning the presentation, accessing learning resources using Moodle before learning in the classroom. It intensified students’ interest in understanding biotechnology. This was evidenced by good responses from students in the first experiment class that the other classes as shown in Figure 1.

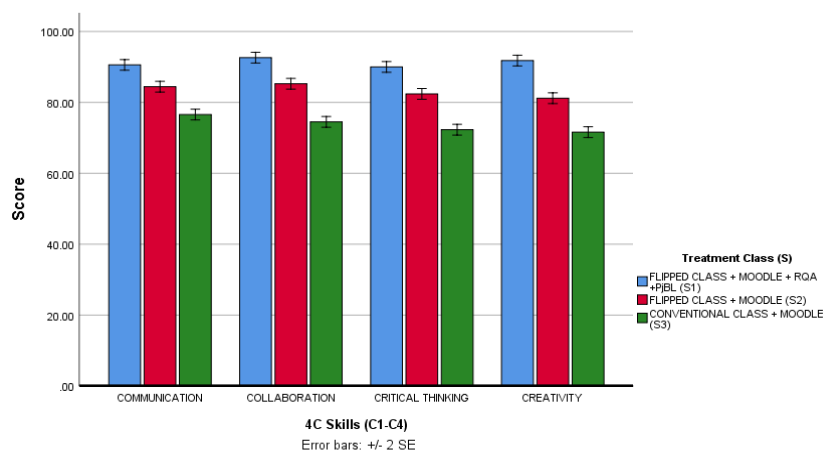


Figure 1. Comparison of 4C skills (communication, collaboration, critical thinking, creativity) values ( $df = 2, p = 0.000$ ). The error bar showed the standard error. Data was analyzed using Two-Way Anova. The color difference on the graph shows the learning activities in the different treatment classes.

Learning activities using the Moodle should develop creative thinking and communication skills. Activity planning for biotechnology project can be easily accessed through the Moodle account owned by each student. Students could take advantage of the digital study room to compile project work that has been mutually agreed upon in the team before starting learning activities (see Figure 2).



Figure 2. Students' learning activities

This activity can encourage students' 4C skills as summarized in Figure 3 with multi-comparisons data (see Table 3).

Table 3. Summary of ANOVA Test Results of Student's 4C Skills ( $\alpha=0.05, sig.0.000$ )

Multiple Comparisons						
(I) KEGIATAN PEMBELAJARAN (S)	(J) KEGIATAN PEMBELAJARAN (S)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
FLIPPED CLASS+MOODLE+RQA+PjBL	FLIPPED CLASS+MOODLE	8.4800*	.79928	.000	6.5208	10.4392
	CONVENTIONAL CLASS+MOODLE	17.8800*	.79928	.000	15.9208	19.8392
FLIPPED CLASS+MOODLE	FLIPPED CLASS+MOODLE+RQA+PjBL	-8.4800*	.79928	.000	-10.4392	-6.5208
	CONVENTIONAL CLASS+MOODLE	9.4000*	.79928	.000	7.4408	11.3592
CONVENTIONAL CLASS+MOODLE	FLIPPED CLASS+MOODLE+RQA+PjBL	-17.8800*	.79928	.000	-19.8392	-15.9208
	FLIPPED CLASS+MOODLE	-9.4000*	.79928	.000	-11.3592	-7.4408

Teacher inserted a case study material (text, animation, video, sound) in Moodle to provoke students to think critically about a certain issue. Students would think critically when they need solution to solve the problem about biotechnology implementation.



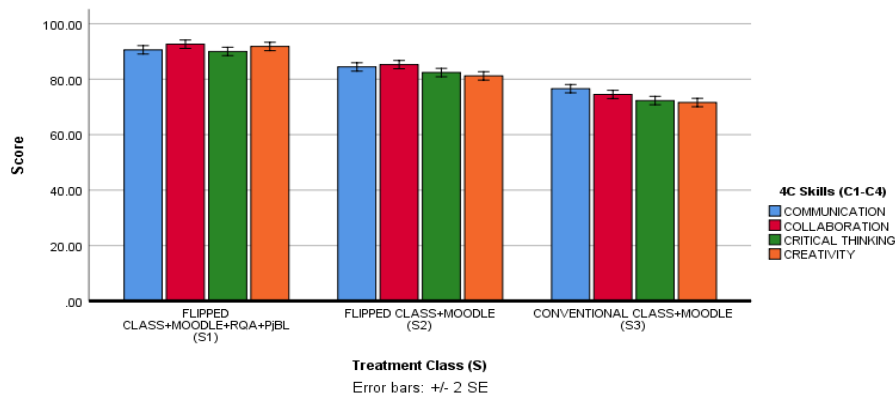


Figure 3. Comparison of 4C skills values in three different classes (s1, s2, s3) with  $df=2$ ,  $p= 0.000$ . the error bar shows the standard error. Data was analyzed using Two-Way Anova. The color difference on the chart indicates 4C skills.

The projects were designed to entice the students to explain their opinions. It means that the teacher’s decision to use project-based learning for learning biotechnology was the right decision. The correlation between of flipped class with PjBL, Moodle, and RQA strategy can be seen in Table 3.

Table 3. Summary of the Correlation Between Flipped Class with PjBL, Moodle, and RQA

<i>Flipped Classroom (Online and Face to Face)</i>				
Learning Material	PjBL	Aspects of Science and Digital Literacy	RQA	4C Skills
Biotechnology linked to Moodle as Learning Management System	Fundamental Questions	Identifying Issues	<i>Reading and Questioning</i>	<i>Critical Thinking</i>
	Product Planning	Explaining Phenomenon	<i>Reading and Answering</i>	<i>Creative</i>
	Product Manufacturing	Using Scientific Evidence	<i>Reading and Answering</i>	<i>Collaboration and Creative</i>
	Monitoring	Using Scientific Evidence	<i>Reading and Answering</i>	<i>Communication</i>
	Test Results	Using Scientific Evidence	<i>Answering</i>	<i>Communication</i>

The results show significant differences in the three classes ( $\alpha = 0.05$ , sig.0.00). It was signed by higher result obtained by the first treatment class, followed by the second and third with average scores as follows: 91.25; 91.52 (very competent), 83.32; 83.04 (very competent) and 73.74; 73.64 (competent). These findings were expected to be a recommendation for educators to integrate the 4C skills through flipped class. The comparison of final score in three treatment classes can be seen in Figure 4 and Figure 5 as follows.

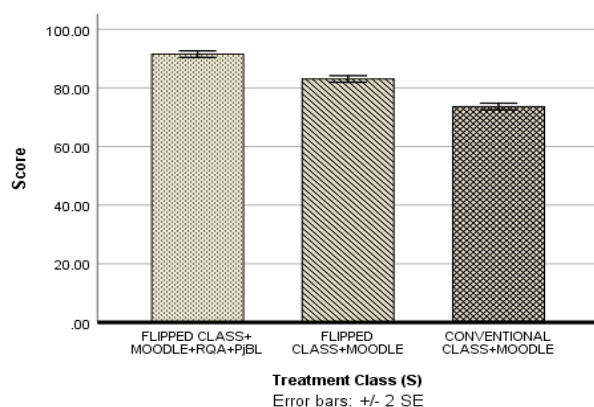


Figure 4. Student's response in three different classes with  $df=2$ ,  $p=0.000$ . The error bar shows the standard error. Data were analyzed using Anova. The difference in the pattern on the graph showed the learning activities in different treatment classes.

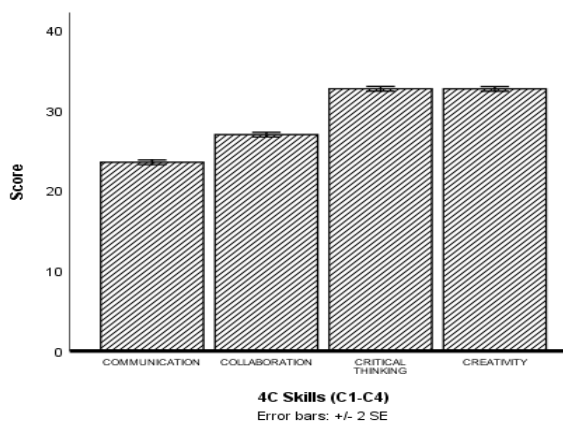


Figure 5. Comparison of 4C Skills Scores in all classes with  $df=2$ ,  $p=0.000$ . The error bar shows the standard error. Data were analyzed using Two-Way Anova.

Project-based learning required students to provide creative ideas during project completion process. PjBL syntax applied in this study was finding ideas, designing projects, drawing up project arrangements, carrying out the project, and assessing the product. Project-based learning (PjBL) was an innovative learning approach to the improvement of twenty-first century skills (4Cs). PjBL was a student's-centered learning. In this case, students gained the understanding through questions that can answer their curiosity (Bell, 2010).

Furthermore, PjBL asked students to determine their own research questions to be guided by teachers to conduct research. PjBL help students to be equipped with life skills. In line with the opinion of Barron et al. (1998), PjBL make students learn to work together and develop 4C skills. The learning process in PjBL also allowed collaboration among students to solving the problems related. They are required to work together to solve problems, conducted creative experiments, and created innovative projects. Projects from students could be in individual or group projects through collaborative manner within a certain period of time to produce a product, and the results are to be displayed or presented.

The PjBL emphasizes students-centered learning and position the teacher as a facilitator, while students worked actively in small groups to teach each other and helped their friends to form their knowledges. This was in line with the learning activities in the flip classroom. In the PjBL, students carried out meaningful interactions and collaborations to solve the problems and completing their projects. Those interactions can nurture the 21st century skills (4Cs). It was proven by the more positive student's response (83.04 - 91.52) towards the flipped class with Moodle and PjBL.

The projects were designed to require students to explain their opinions. Project-based learning itself has been proven to be effective in improving students' communication skills, such as the study of Asih et al. (2019) which showed project-based learning enhanced communication skills of vocational students. This was in line with the Karyadi et al. (2020) research which showed that communication skills were developed using PjBL. The study by (Haatainen & Aksela, 2021) found that 21<sup>st</sup> century skills could be developed using PjBL. Teachers can insert 4C values in various ways. For example, the critical thinking can be developed by using several study cases related to biotechnology problems to be solved by integrating reading, questioning and answering strategy. Here, students have to think to find

solutions by considering the given conditions or situations. Creative thinking skill can be nurtured by requiring students to provide creative ideas to finish the project. The tasks in question included making personal design, creating new products to be presented, and promoting the products. Collaboration skills can be developed using group or pair assignments where students have to work together with each other.

Various digital literacy-based flipped learning has been developed to motivate the students to learn biology (Bangun & Naphiah, 2021). All students were very enthusiastic in studying and designing the project. The use of digital technology and flexible time to do the assignments were the main attractions for students to express. The model developed in this study changed the concept of traditional learning activities which were usually carried out in the classroom or just implemented at home. Thus, learning at home which usually only did assignments were replaced with activities to study the topic and carry out evaluations. Assignments and writing exercises can be carried out at school. In other words, this model reversed the traditional learning that was commonly inspiring many educators to implement this learning model during teaching in the class.

This flipped learning assisted by PjBL model was developed to train students to search, find, sort, and understand information appropriately. This model was designed to direct students to study independently and in groups. Studying using the flipped learning model could improve students' abilities if this model was packaged in diversity of students (Prasetya, 2021).

The flipped learning process with Moodle can train students' science process skills because it familiarizes the students with scientific activities including identifying scientific questions, providing scientific explanations of phenomena, and using scientific evidence. Flipped learning with Moodle and RQA strategy can improve students' digital literacy. Online learning using Moodle contained interactive modules, teaching materials, practice questions that could be used by teachers and students both inside and outside the classroom (Styers et al., 2018).

Barr (2011) stated that flipped learning could improve student performance. Flipped learning combines the face to face and online learning methods. It could actively involve students and allowed students to get feedback. Purwasih et al. (2021) concluded that learning using blended learning was proven to improve students' cognitive abilities. Furthermore, research by Putri et al. (2021) stated that blended learning can improve students' mastery of concepts and reasoning. Moodle contained the learning resources. It guides students in doing scientific learning activities from observing, investigating and finally obtaining conclusion (Sari et al., 2022).

Another benefit of implementing PjBL-RQA strategy was to train cooperative and collaborative group learning. Corebima (2009) suggested that RQA can empower students' metacognitive skills when implemented in group learning. Cooperative learning has the potential to empower students' 21<sup>st</sup> century skills. Hewitt & Carolyn (1995) stated that cooperative learning aimed to enable students to share the skills and experiences in forming new meanings.

## Conclusion

Flipped learning could involve students actively and allowed students to get feedback. Moodle contained the learning resources. It guides students in doing scientific learning activities from observing, investigating and finally obtaining conclusion. The PjBL-RQA strategy trained group learning cooperatively during peer studying. Teacher inserted the value of communication in almost every meeting, starting from discussions on forums created in Moodle, creating assignments that required students to communicate, and practicing their communication skill through face-to-face meeting in the class.



Students' cognitive posttest and learning response were superior at the first experiment class, followed by the second and third treatment classes with average scores respectively: 91.25; 91.52 (very competent), 83.32; 83.04 (very competent) and 73.74; 73.64 (competent). The most dominant method used was project-based which focuses on students' role-play tasks. Problems faced by teachers when using Moodle included the lack of student awareness, the need for extra effort to adapt to this online learning medium, and internet connection problems. Overall, teaching using Moodle in flipped class integrated with RQA strategy and PjBL can help to carry out interactive learning and teaching process.

### Research Limitation and Future Work

This research was limited to measure the 4C skills (Critical Thinking, Creative, Collaboration, Communication) on biotechnology. These findings were expected to be a recommendation for educators to integrate the 4C skills through flipped class.

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### References

- Ardinengtyas, A., Himawan, A. N. (2021). Enhancing ELT Classroom Using Moodle E-Learning During the Pandemic: Students' and Teachers' Voices. *IJEE (Indonesian Journal of English Education)*, 8(1), 31–46. <https://doi.org/10.15408/ijee.v8i1.20220>
- Asih, N. F., & Ellianawati, E. (2019). The Enhancement of Verbal Communication Skills for Vocational Students through Project-Based Learning Physics. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, 5(1), 21–28. <https://doi.org/10.21009/1.05103>
- Bangun, W. A., & Naphiah, S. (2021). Project Based Learning dengan Desain Flipped Classroom Tipe Peer Instruction Flipped untuk Meningkatkan Keterampilan Berpikir Kritis Dan Literasi Sains. *Jurnal PAJAR (Pendidikan Dan Pengajaran)*, 5(2), 442–448. <https://doi.org/10.33578/pjr.v5i2.8214>
- Barron, B. J. S., Schwartz, D. L., Vye, N. J., Moore, A., Petrosino, A., Zech, L., & Bransford, J. D. (1998). Doing with Understanding: Lessons from Research on Problem- and Project-Based Learning. *Journal of the Learning Sciences*, 7(3–4), 271–311. <https://doi.org/10.1080/10508406.1998.9672056>
- Bell, S. (2010). Project-Based Learning for the 21st Century: Skills for the Future. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 83(2), 39–43. <https://doi.org/10.1080/00098650903505415>
- Corebima. (2009). *Berdayakan Keterampilan Berpikir Selama Pembelajaran SAINS Demi Masa Depan Kita*. UNESA University Press.
- Ennis, R. H. (2011). The Nature of Critical Thinking: An Outline of Critical Thinking Dispositions. *Inquiry*, 26(1), 1–8.
- Haatainen, O., & Aksela, M. (2021). The Flipped Chemistry Classroom: A Case Study of Year 9 Students' Views and Performance. *Journal of Primary Education*, 5(1), 7. <https://doi.org/10.33578/pjr.v5i2.8214>
- Hague, C., & Payton, S. (2010). *Digital Literacy Across the Curriculum: a Futurelab Handbook*. Futurelab. <https://www.nfer.ac.uk/digital-literacy-across-the-curriculum>
- Hewitt, Duncan; Carolyn, W. (1995). *A Handbook on Cooperative Learning* (Second Ed). Pacific

Crest Software.

- Karyadi, P. A., Paristiowati, M., & Afrizal, A. (2020). Analysis the 21St Century Skills of Students in Chemical Equilibrium Learning With Flipped Classroom-Collaborative Problem Solving Model. *JTK (Jurnal Tadris Kimiya)*, 5(1), 48–60. <https://doi.org/10.15575/jtk.v5i1.7971>
- Nalantha, I. M. D., Padmadewi, N. N., & Artini, L. P. (2021). *An Analysis of 4C Skills in Teaching English Using Moodle at IPB International*. 9(2), 109–124. <https://doi.org/10.23887/jpbi.v9i2.499>
- OECD. (2018). *Education GPS*, OECD. [gpseducation.oecd.org](http://gpseducation.oecd.org)
- Pintalitna, W., Sipahutar, H., & Harahap, F. (2015). Designing Interactive Digital Learning Module in Biology. *Tabularasa*, 12(2), 200–213. <https://doi.org/10.24114/jt.v12i2.3249>
- Prasetya, R. E. (2021). Student Centre Approach in Teaching English for Specific Purposes Moodle-Based. *English Education: Jurnal Tadris Bahasa Inggris*, 14(1), 115–135. <https://doi.org/10.24042/ee-jtbi.v14i1.8172>
- Pudiyono. (2019). Applying The Twenty First Century Skills ( 4c Skills ) in Present Classroom Instructions. *Advances in Social Science, Education and Humanities Research*, 355(4), 1–5. <https://doi.org/10.2991/pfeic-19.2019.1>
- Purnawirawan, O., Sudana, I. M., & Harlanu, M. (2019). Assessment of 4C Softskills Characteristics in Learning Productive Graphic Design Subject for Vocational School. *Journal of Vocational and Career Education*, 4(1), 53–60. <https://doi.org/10.15294/jvce.v4i1.21867>
- Purwasih, R., Rahimullaily, R., & Suryani, A. I. (2021). Blended Learning Model in Improving 4C Abilities of Information System Students. *JPI (Jurnal Pendidikan Indonesia)*, 10(4), 742–753. <https://doi.org/10.23887/jpi-undiksha.v10i4.30939>
- Putri, Y., Cahyono, E., & Indriyanti, D. R. (2021). Implementation of Flipped Classroom Learning Model to Increase Student's Critical Thinking Ability. *Journal of Innovative Science Education*, 10(2), 143–151. <https://journal.unnes.ac.id/sju/index.php/jise/article/view/41408>
- Rahayu, R., Rosita, R., Rahayuningsih, Y. S., Hernawan, A.H., P. (2021). Implementasi Kurikulum Merdeka Belajar di Sekolah Penggerak. *Jurnal Basicedu*, 5(4), 2541–2549. <https://ojs.unm.ac.id/semnaslemlit/article/view/25268>
- Sari, D.N., Nopita, D., Subroto, G. (2022). The Implementation of Flipped Classroom by Using LMS ( Learning Management System ). *Journal of Language, Literature, and English Teaching (JULIET)*, 3(4), 1–9.
- Styers, M. L., Van Zandt, P. A., & Hayden, K. L. (2018). Active learning in flipped life science courses promotes development of critical thinking skills. *CBE Life Sciences Education*, 17(3), 1–13. <https://doi.org/10.1187/cbe.16-11-0332>
- Supriadi, D. (1997). *Kualitas Kebudayaan dan Perkembangan IPTEK*. PT. Alfa Beta.
- Tarigan, W. P. L., Sipahutar, H., & Harahap, F. (2021). The Effect of Interactive Digital Learning Module on Student's Learning Activity and Autonomy. *Bioedukasi: Jurnal Pendidikan Biologi*, 14(2), 196. <https://doi.org/10.20961/bioedukasi-uns.v14i2.49366>
- Triana, D., Anggraito, Y. U., & Ridlo, S. (2020). Effectiveness of Environmental Change Learning Tools Based on STEM-PjBL Towards 4C Skills of Students. *Jise*, 9(2), 181–187. <http://journal.unnes.ac.id/sju/index.php/jise>
- Ventayen, R. J. M., Estira, K. L. A., Guzman, M. J. De, Cabaluna, C. M., & Espinosa, N. N. (2018). Usability Evaluation of Google Classroom: Basis for the Adaptation of GSuite E-Learning Platform Software Management View project Data Analysis View project. *Asia Pacific Journal of Education, Arts and Sciences*, 5(1), 47–51.