Analyzing of Using Case Method Based on Flipped Classroom on Student Learning Outcomes

Ismul Huda[1*], Putri Desriana[2], Safrida[1], Cut Nurmaliah[1], Muhibbuddin[1]

[1] Department of Biology Education, Faculty of Teacher Training and Education, Universitas Syiah Kuala, Banda Aceh, Indonesia.
[2] Magister of Biology Education, Faculty of Teacher Training and Education, Universitas Syiah Kuala, Banda Aceh, Indonesia.

Abstract: An important goal of learning system is to deliver instruction that can produce equal or better learning outcomes. To achieve this goal, the number of research has been conducted to address the issue of what antecedent variables can affect the student learning outcomes. One of the methods which can develop student learning outcomes is case method based on flipped classroom. This research was conducted to analyze student learning outcomes using case method based on flipped classroom. This research is the quasi-experimental research with posttest only control group design. There is the control class and the experimental class in this research with a little of case method vs a lot of case method design. The participants in this study were 82 biology students using the total sampling technique. Data were analyzed using ANOVA to analyze the student learning outcome using case method based on flipped classroom. The results of study using case method based on flipped classroom has significant effect on student learning outcomes with a significance value of $p < 0.05$ with $F_{(6.59)} = 3.97$, $p=.012$. Thus, it can be concluded that the case method which is combine with flipped classroom gives the positive impact on student learning outcomes.

Keywords: Case method; Flipped classroom; Quasi experimental; Student performance

Introduction

Over the present century, the educational system has rapidly changed and the technology has been used in education. This has prompted educational institutions to introduce a new learning system in university to respond the change.

Beside the technological skill to face the change in education, the problem-solving skill is also needed nowadays. The Previous research shows that student problem solving ability is still low (Kane et al., 2016). The research which is conducted by Hapsari (2021) also shows low problem solving skills involving planning skills, monitoring skills, and evaluating skills. The experience from another research that problem solving skill affects student learning outcomes (Indriyanti & Yamtinah, 2020). Therefore, this ability needs to be developed by every student. The problem in this study is that the student has low learning outcomes and problem solving skills, so they cannot have the ability to solve the case, to organize their study, to control and to

evaluate the learning process (Krathwohl, 2002). In addition, the students who have low problem solving skill will cause difficulty in learning and decision making (Astriani et al., 2020). Even though, the problem solving skill and decision making are skills that are needed in the real world (Ananda, 2018). Problem solving and decision making skills are needed by biology students because learning biology basically requires scientific investigation skills that will affect the student learning outcomes (Bonney, 2015; Jianli, 2012; Schuster et al., 2020; Susilo et al., 2019). The problem solving skill and technological skill need to be trained and developed in biology students (Bonney, 2015; Jianli, 2012).

One of the regulations established by the ministry of education through the main work indicators in paragraphs 14 and 3 is regarding the case-based learning method. There are 8 data from the main work indicators that affect the quality of education, one of which is indicator 7 regarding collaborative and participatory classes. On the seventh indicator, the case method is a

---

learning solution to create a collaborative and participatory classroom. The case method is a learning method that focuses on real experiences and situations, this method can control student learning activities and can develop metacognitive abilities, and influence learning outcomes (Schuster et al., 2020). While usage flipped classroom could increase self-regulated learning which is also related to student learning outcomes. This combination will enhance learning outcome.

Learning with case method based flipped classroom has a positive impact on critical thinking skills, problem solving, communication skills, collaboration, and creativity (Servant-Miklos, 2019). According to research was conducted by Cakmak et al. (2017) case method based flipped classroom will allow students to acquire knowledge and skills in dealing with the problems that they are solving and will produce information-based solutions that can be implied in the real world. In this situation, case method based on flipped classroom will affect student learning outcomes (van Alten et al., 2019). Furthermore, case method connects the theory with practice, encouraging communication and decision-making skills (Efremenko et al., 2020; Liu, 2019; Tan et al., 2017). Based on the results of previous studies also show that learning with case method based flipped classroom provide positive results on learning outcomes (Baragash & Al-Samarraie, 2018; Diana et al., 2020; Erdem & Kibar, 2014; Kane et al., 2016). According to Huang (2007) a wide range of research studies have found that the flipped classroom approach has positive effects on student achievement, while other studies have indicated that flipped classroom achieves levels of student success equivalent to traditional education.

Problem solving, decision making skill and technological skills are necessary for successful learning (Nurmaliah & Khairil, 2018), thus enabling students to develop into independent learners because it encourages them to become managers for themselves and become assessors of their own thinking and learning (Hapsari et al., 2021; Siregar et al., 2017). According to Whittaker (2009) there is a relationship between case method to learning outcomes. The case method requires students to be innovative in solving the problem, and solving the problem skill will impact student learning outcome (Cakmak & Akgün, 2017; Servant-Miklos, 2019). The research was conducted by Krain (2016) and Whittaker (2009) show that the higher level of self-regulation in students, the more strategic they will be in solving a case compared to those who have low self-regulation.

Case method implementation which is assisted by flipped classroom will integrate students to solve the problem and manage learning process through face-to-face and technology-based virtual classes and e-learning (Ceylan & Elitok Kesici, 2017; van Alten et al., 2019).

Flipped classroom presents a new paradigm in the world of education, it assists students in accelerating the process of critical thinking (Vernadakis et al., 2012).

There is a very close relationship between case method based flipped classroom with learning outcomes. Implementation case method flipped classroom will have a positive impact on students' learning outcomes (Kane et al., 2016). Students who are given learning with this method will have good abilities regarding planning, evaluation and procedural knowledge so that they can easier to solve the problem (Leonard & Cook, 2010). Therefore, a study was conducted to analyze the effect of using case method based flipped classroom on student learning outcomes.

Method

This research has used quasi-experimental with a nonrandomized control group, posttest only control group design. The use of this design is due to non-random sampling and only being given a posttest to obtain learning outcomes (Ary et al., 2010).

The participants in this study were 82 students who are in the first semester and took general biology courses. The sample was taken through total sampling which means the sample is the entire of population. The sample consists of 4 classes consisting of classes 01 and 02 as the control class which is given of case method directed case and classes 03 and 04 as the experimental class which is given of case method issue case (Ary et al., 2010). Learning by case method in this research is applied through flipped classroom and using the case method syntax. The learning step of case method in this research can be seen in https://spada.aceh.web.id

After the treatment, each class whether the control class or experimental class was given a posttest. The student learning outcome was obtained through a posttest which consisted of 30 validated questions. While qualitative data about demographics and experience using e-learning and case method was collected online form.

Data analysis was carried out by testing the validity and reliability to obtain valid data from the instrument. Then it is tested for outliers, normality, and homogeneity. ANOVA is used to analyzed quantitative data to find whether it is significant or unsignificant effect.

Result and Discussion

Demography

There are 82 respondents in this research, 87.8% are female and 12.2% are male. In the category of age distribution, the average age of respondents is 18 years.

Furthermore, in the category of majors at SMA 98% are IPA with the assumption that the respondent already has the basic knowledge of biology. In the learning experience category of using the case method, the respondents were distributed as follows: 53,6% of respondents have never studied in the case method, and 51,2% previously knew the case method. Table 2 also indicates the access frequency of e-learning in this research, the most frequent access is 3 times a week which is accessed by 45 respondents, followed 1 time a week and the lowest frequent access is only 1,2% which is accessed only one respondent (table 1). The frequent access is important in this research because the learning is conducted by e-learning system. The more students involve themselves on e-learning system, the more students will understand the course and it is assumed that can influence the student learning outcomes.

The percentage of students who know the case method is lower than that of the students who understand it. This category is important because the knowledge about the case method will affect their learning. Students who are first given of case method will difficulty to solve the case (Bi et al., 2019).

Table 1. Demography Background

Classification	Percentage (%)	Frequency
Gender		
Male	12.20	10
Female	87.80	72
Age		
21 Years	3.60	3
20 Years	9.70	8
19 Years	8.50	7
18 Years	73.10	60
17 Years	4.80	4
Major in SMA		
IPA	98.70	81
IPS	0.00	0
Keperawatan	1.20	1
The experience study using case method		
Ever	51.20	42
Never	53.60	44
E-Learning Using		
1 time a week	29.20	24
3 times a week	54.80	45
5 times a week	10.90	9
7 times a week	1.20	1
>7 times a week	3.60	3

Validity and Reliability

The Test result of the posttest instrument for student learning outcomes was tested by validity and reliability. The test result shows that there are 22 questions valid and 8 questions are invalid. Criteria of validity if the value of R count > R table 0.1829 (df = 82- Meanwhile, for the reliability test, the Cronbach alpha value was 0.668, which means that it is greater than the test criteria value. It can be concluded that the data obtained from the 22 questions are reliable.

Student Learning Outcome

An ANOVA test for student learning outcomes shows that there is statistically significant difference using the case method flipped classroom on student learning outcomes. The significant value for the learning outcome variable is $p < 0.05$ with F (6.59) = 3.97, p=.012 which means the use of this method has significant effect on learning outcomes.

The research conducted by Gillette (2018) states that there is significant difference between students who are given learning flipped classroom and face-to-face learning. According to Table 2, The mean shows that the students who are in the experimental class have the better learning outcomes than the students in the control class. This is caused by several factors, the students who are in experimental class given the issue case, their analytical skill was developed. They prepare themselves better to solve the issue case because their case more difficult. Therefore, it will impact on their learning outcomes.

On the other sides, preparing the case method learning design takes a long time until e-learning design is formed that appropriate to the students, after in-depth analysis, the case method learning design that has been made can be completed by students and they also actively participate in solving the case.

Table 2. The Anova Summary of Learning Outcomes

Learning Outcomes	N	Mean	Standard Deviation	df	ANOVA*
Directed Case	37	17.35	3.326	74	F (6.59) = 3.97
Issue Case	38	19.15	1.826		P = .012

*. Sig > 0.05

The mean of the learning outcome is 20.52 and a standard deviation is 3.85. From the whole of the sample, the highest frequency is for 24 with total 15 students. while the scores of 8, 9, 10, 13 and 16 had the smallest frequency, there is only 1 student for every that score. The score of learning outcomes is obtained by providing a posttest instrument with 30 questions. The learning outcomes analyzed in this study are absolute learning outcomes whose score does not change. The highest learning outcome is 26 with a frequency of 4 students and the lowest learning outcome is 8 with a frequency of 1 student.

Another study conducted by Van Vliet (2015) states that the effect of using flipped classroom in learning will

not last long, but it has significant effect. The purpose of this method prepares the students to understand and reconstruct difficult concepts before class begins. If students are not optimal in integrating themselves, they will lose their time which ultimately affects learning outcomes. The study conducted by Boevé (2017)) states that flipped classrooms will have an impact on learning outcomes if the learning design is appropriate to the context of student needs, the implementation must also be assisted by face-to-face learning. In this case, the effectiveness of the flipped classroom on learning outcomes is very dependent on the design and model of the class given. Much Research states that the case method can affect learning outcomes (Bonney, 2015; Leonard & Cook, 2010; Liu, 2019), but the implementation must be done face-to-face. This is caused by the existence of complex case method learning steps such as preparation before class which consists of reading and gathering information related to a given case, when the class begins, students must be able to solve cases and provide solutions to cases presented and after class students must be able to reflect the relationship of cases with the learning topics (Harling & Akridge, 1998).

The statistical result shows that case method- based flipped classroom has a significant effect on learning outcomes. This method affects learning outcomes due to several factors. First, the cases given are cases that are related to real life and require analytical skills, not theoretical and conceptual, but still related to the topic of the material to be discussed, and the consequence is compatibility cognitive development. So, the students will easy to find ideas and discuss the case. Second, preparing a learning design of the case method takes a long time to produce a suitable learning design for students, after in-depth analysis, it was found that many students were able to follow the learning steps that had been prepared. This is evidenced by the existence of activity stages that were filled by students.

The research conducted by Cakmak (2017) states that there are many advantages in the implementation of the case method. So that it will affect learning outcomes, these advantages consist of preparation of learning designs, case analysis so that the solutions can be transferred into real life, and students' preparedness in accepting cases so these advantages will affect student productivity. Research conducted by Bi (2019) and Hidayati (2021) also reported that some students have high learning outcomes when given a case method for the first time because this is a challenge for students to solve a case.

Conclusion

Based on data analysis, case method based flipped classroom has a significant effect on learning outcomes. The students who are given the issue case perform well in learning outcome than the students who are given the issue case. But, both of the types give the positive impact on learning outcomes. Therefore, the implementation of the flipped classroom-based case method is not simple because it requires teachers and students to prepare themselves before class begins, during class, and also after class. This method requires a design that fits the student's need, so that in the future it can develop student's cognitive. The combination case method with flipped classroom has a positive impact on student learning outcome. There is a statistically difference between the students who are given directed case and the students who are given the issue case

Author Contributions
The authors confirm contribution to this paper as follows: conceived of the presented ide, study conception, design, data collection, and draft manuscript preparation: Ismul Huda and Putri Desriana. Analysis and interpretation of results: Safrida, Cut Nurmaliah, and Muhibbuddin. All authors reviewed the results and approved the final version of the manuscript.

Conflicts of Interest
No Conflicts of interest.

References

Ananda, R. (2018). The Effectiveness of the Implementation of the Case Methods in the Learning Evaluation Course at State Islamic University of North Sumatera. *Jurnal Ilmiah Peuradeun*, *6*(1), 103. https://doi.org/10.26811/peuradeun.v6i1.171

Ary, D., Jacobs, L., & Sorensen, C. (2010). *Introduction to Research in Education* (8th ed., Vol. 8). Cengage Learning.

Astriani, D., Susilo, H., Suwono, H., Lukiati, B., & Purnomo, A. R. (2020). Mind mapping in learning models: A tool to improve student metacognitive skills. *International Journal of Emerging Technologies in Learning*, *15*(6), 4–17. https://doi.org/10.3991/IJET.V15I06.12657

Baragash, R. S., & Al-Samarraie, H. (2018). Blended learning: Investigating the influence of engagement in multiple learning delivery modes on students' performance. *Telematics and Informatics*, *35*(7), 2082–2098. https://doi.org/10.1016/j.tele.2018.07.010

Bi, M., Zhao, Z., Yang, J., & Wang, Y. (2019). Comparison

of case-based learning and traditional method in teaching postgraduate students of medical oncology. *Medical Teacher*, *41*(10), 1124–1128. https://doi.org/10.1080/0142159X.2019.1617414

Boevé, A. J., Meijer, R. R., Bosker, R. J., Vugteveen, J., Hoekstra, R., & Albers, C. J. (2017). Implementing the flipped classroom: an exploration of study behaviour and student performance. *Higher Education*, *74*(6), 1015–1032. https://doi.org/10.1007/s10734-016-0104-y

Bonney, K. M. (2015). Case Study Teaching Method Improves Student Performance and Perceptions of Learning Gains. *Journal of Microbiology & Biology Education*, *16*(1), 21–28. https://doi.org/10.1128/jmbe.v16i1.846

Cakmak, Z., & Akgün, I. H. (2017). A Theoretical Perspective on the Case Study Method. *Journal of Education and Learning*, *7*(1), 96. https://doi.org/10.5539/jel.v7n1p96

Ceylan, V. K., & Elitok Kesici, A. (2017). Effect of blended learning to academic achievement. *Journal of Human Sciences*, *14*(1), 308. https://doi.org/10.14687/jhs.v14i1.4141

Diana, P. Z., Wirawati, D., & Rosalia, S. (2020). Blended Learning dalam Pembentukan Kemandirian Belajar. *Alinea: Jurnal Bahasa, Sastra, Dan Pengajaran*, *9*(1), 16. https://doi.org/10.35194/alinea.v9i1.763

Efremenko, A. P., Berezhnoy, D. A., Tsilinko, A. P., Lomakina, T. A., & Solovey, A. I. (2020). Case method in vocational training for future specialists of culture and art. *Universal Journal of Educational Research*, *8*(9), 3793–3798. https://doi.org/10.13189/ujer.2020.080901

Erdem, M., & Kibar, P. N. (2014). Students' opinions on facebook supported blended learning environment. *Turkish Online Journal of Educational Technology*, *13*(1), 199–206. Retrieved from https://eric.ed.gov/?id=EJ1018185

Gillette, C., Rudolph, M., Kimble, C., Rockich-Winston, N., Smith, L., & Broedel-Zaugg, K. (2018). A meta-analysis of outcomes comparing flipped classroom and lecture. *American Journal of Pharmaceutical Education*, *82*(5), 433–440. https://doi.org/10.5688/ajpe6898

Hapsari, R., Hapsari, R. W., Ardianti, S. D., & Ismaya, E. A. (2021). Parents' Role in Assisting Children in Online Learning During Covid-19 Pandemic. *JURNAL PAJAR (Pendidikan Dan Pengajaran)*, *5*(3), 656–662. https://doi.org/10.33578/pjr.v5i3.8310

Harling, K. F., & Akridge, J. (1998). Using the case method of teaching. *Agribusiness*, *14*(1), 1–14. https://doi.org/10.1002/(SICI)1520-6297(199801/02)14:1<1::AID-AGR1>3.0.CO;2-8

Hidayati, L. (2021). Case-based Method and its Implementation in English for Medical Purposes.

Journal of Language, Literature, and English Teaching (JULIET), *2*(2), 1–7. https://doi.org/10.31629/juliet.v2i2.3695

Huang, M., Huang, H., & Chen, M. (2007). Constructing a personalized e-learning system based on genetic algorithm and case-based reasoning approach. *Expert Systems with Applications*, *33*(3), 551–564. https://doi.org/10.1016/j.eswa.2006.05.019

Indriyanti, N. Y., & Yamtinah, S. (2020). An Inquiry into Students' Metacognition and Learning Achievement in a Blended Learning Design. *International Journal of Emerging Technologies in Learning*, *15*(21), 77–88. https://doi.org/10.3991/ijet.v15i21.12907

Jianli, S. (2012). The Research on Case Method in Management Teaching. *IERI Procedia*, *3*, 41–45. https://doi.org/10.1016/j.ieri.2012.09.008

Kane, S. N., Mishra, A., & Dutta, A. K. (2016). Preface: International Conference on Recent Trends in Physics (ICRTP 2016). *Journal of Physics: Conference Series*, *755*(1), 0–5. https://doi.org/10.1088/1742-6596/755/1/011001

Krain, M. (2016). Putting the Learning in Case Learning? The Effects of Case-Based Approaches on Student Knowledge, Attitudes, and Engagement. *The Journal of Excellence in College Teaching*, *27*(2), 131–153. Retrieved from https://discover.wooster.edu/mkrain/files/2012/12/Krain-JECT2015.pdf

Krathwohl, D. R. (2002). A revision of bloom's taxonomy: An overview. *Theory into Practice*, *41*(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2

Leonard, E. C., & Cook, R. A. (2010). Teaching with cases. *Journal of Teaching in Travel and Tourism*, *10*(1), 95–101. https://doi.org/10.1080/15313220903559296

Liu, W.-Y. (2019). The Use of the Case Method to Promote Reflective Thinking in Teacher Education. *Advances in Social Sciences Research Journal*, *24*(2), 33–44. https://doi.org/10.14738/assrj.67.6831

Nurmaliah, C., & Khairil. (2018). Analisis Keterampilan Metakognisi Siswa dengan Penerapan Model Problem Based Learning (PBL) Pada Konsep Sistem Reproduksi Manusia di SMA Negeri 2 Banda Aceh. *Prosiding Seminar Nasional Pendidikan Biologi*, 758–763. Retrieved from https://jurnalfkip.unram.ac.id/index.php/SemnaSBIO/article/view/718

Schuster, C., Stebner, F., Leutner, D., & Wirth, J. (2020). Transfer of metacognitive skills in self-regulated learning: an experimental training study. *Metacognition and Learning*, *15*(3), 455–477. https://doi.org/10.1007/s11409-020-09237-5

Servant-Miklos, V. F. C. (2019). The Harvard

Connection: How the Case Method Spawned Problem-Based Learning at McMaster University. *Health Professions Education*, *5*(3), 163–171. https://doi.org/10.1016/j.hpe.2018.07.004

Siregar, I. Y., Susilo, H., & Suwono, H. (2017). The effect of think-pair-share-write based on hybrid learning on metacognitive skills, creative thinking and cognitive learning at SMA negeri 3 Malang. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, *3*(2), 183–193. https://doi.org/10.22219/jpbi.v3i2.4217

Susilo, J., Kartono, K., & Mastur, Z. (2019). Analysis Metacognition and Communication Mathematics in Blended Learning Use Google Classroom. *Ujmer:Unnes Journal of Mathematics Education Research*, *8*(1), 72–83. Retrieved from https://journal.unnes.ac.id/sju/index.php/ujmer/article/view/24825

Tan, C., Yue, W.-G., & Fu, Y. (2017). Effectiveness of flipped classrooms in nursing education: Systematic review and meta-analysis. *Chinese Nursing Research*, *4*(4), 192–200. https://doi.org/10.1016/j.cnre.2017.10.006

van Alten, D. C. D., Phielix, C., Janssen, J., & Kester, L. (2019). Effects of flipping the classroom on learning outcomes and satisfaction: A meta-analysis. *Educational Research Review*, *28*, 100281. https://doi.org/10.1016/j.edurev.2019.05.003

Van Vliet, E. A., Winnips, J. C., & Brouwer, N. (2015). Flipped-class pedagogy enhances student metacognition and collaborative-learning strategies in higher education but effect does not persist. *CBE Life Sciences Education*, *14*(3), 1–10. https://doi.org/10.1187/cbe.14-09-0141

Vernadakis, N., Giannousi, M., Derri, V., Michalopoulos, M., & Kioumourtzoglou, E. (2012). The impact of blended and traditional instruction in students' performance. *Procedia Technology*, *1*, 439–443. https://doi.org/10.1016/j.protcy.2012.02.098

Whittaker, C., & van Garderen, D. (2009). Using a Metacognitive Approach with Case-Based Instruction to Enhance Teacher Reflection and Promote Effective Educational Practices for Diverse Learners. *Action in Teacher Education*, *31*(2), 5–16. https://doi.org/10.1080/01626620.2009.10463514