



## The effectiveness of blended learning on plant development structure lectures



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### ABSTRACT

The changes in college curriculum that refers to the Indonesian National Qualifications Framework has consequences on curriculum changes in the Biology Education Study Program of Universitas PGRI Semarang, so that there are adjustments in the course of Plant Anatomy which were initially 2 SKS and Plant Morphology which was initially 2 SKS into one course, Plant Development Structure, with the weight of 3 SKS, so that effective learning is needed by blended learning. Based on this background, the purpose of this study was to determine the effectiveness of blended learning in Plant Development Structure courses. The learning design uses a combination of face to face methods with offline teaching materials using flipbooks, online discussions with Facebook groups and e-assessment using proprofs software. This research method is pre-experiment with the design of the One Group Pretest Posttest. The results of the pretest obtained an average value of 41.84, while the posttest results obtained an average value of 70.97 and the results of the t-test showed that there were significant differences. In the questionnaire results obtained data as many as 43% of students like blended learning; 57% of students stated the advantage of using online discussion was to get direct experience as a teacher candidate using social media as a learning medium; 57% of students stated that offline teaching materials can balance the right and left brains; and 60% of students said by e-assessment to get the correct feedback directly. The conclusion is blended learning that combines face to face, online discussions, offline teaching materials, and e-assessment, and effective blended learning for Plant Development Structure lectures.



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### Introduction

Plant Morphology and Plant Anatomy Subjects are compulsory subjects in the Biology Education Study Program at the University of PGRI Semarang. Both of these courses are theoretical and applicable interdisciplinary courses. The lecture is developed based on the application of the field / environmental experience approach.

In addition to the lecture process, the lecturer further develops student independence to be able to learn about Plant Development Structure material through discussion and observation. It is because the content of the lecture is the primary material of biology education students before taking structure courses higher plants.

Changes in tertiary education curricula that refer to the Indonesian National Qualification Framework (KKNI) have consequences on curriculum changes in the Biology Education Study Program. So an adjustment is made by combining the course of Plant Anatomy (2 credits) with Plant Morphology (2 credits) into one course, namely the Structure of Plant Development (SPT) with a weight of 3 credits. Besides, the Subject Learning Achievement (CPMK) of Complex Plant Structure and Development also provides lecture demands so that it can be carried out effectively and efficiently to integrate the morphological and anatomical understanding of plants. Mulyani (2006) states that knowledge about the anatomical structure of plants, which includes stems, roots, and leaves, is reviewed, starting from cells and tissues. In addition to revealing the anatomical structure, understanding the structure of plants is also able to reveal the relationships between plant structures, including the relationship between cells, cell functions, and tasks as a constituent of the body of living things and other cell functions.

Widodo (2012) revealed that from the aspect of understanding anatomical stem structure, morphological and anatomic leaf structure, morphological and anatomical flower structure, fruit, and seed structure. It correlated with students' understanding of Raunkiaer's life form, which is related to understanding the overall macrostructure of plants. There is confirms that students have not been able to represent the structure of plants based on the function of these structures. In the practical empirical level, it is necessary to have a teaching-learning process that is not only face-to-face, but there is an increase in learning time by utilizing online media. As well as teaching materials accompanied by visualization that clarifies the morphological and anatomical structure to facilitate and accelerate the process of communication between instructors and participants students (learning partners), help the process of accelerating teaching, and help motivate students to get more involved in the learning process.

The existence of blended learning has facilitated current learning. Blended learning is a combination of learning excellence that is done face-to-face with e-learning. According to Hilliard (2015), "The role of technology today using blended

learning has broad implications for the student or learner. The online tools available in blended courses can also significantly enhance student engagement, ensuring that all students and learners participate in course discussions and benefits from collaborative learning. Blended learning becomes a natural extension of traditional classroom learning using face-to-face models. Blended learning makes students able to learn interactively, such as direct learning face to face, but is done when students and lecturers are in different spaces with great distances. This learning can be done anywhere by arranging the study schedule according to the time available.

Semler (as cited in Irmawati, Sriyono, & Santoso, 2012) states that blended learning combines the best aspects of online learning, structured face-to-face activities, and real-world practices. Learning systems with e-learning, classroom exercises, and on-the-job experience will provide valuable experience for themselves. Blended learning uses an approach that empowers various other sources of information. Blended learning becomes an alternative to applying the teaching-learning process. Faizal's research results (as cited in Husamah, 2014) showed that the implementation of blended learning could improve activeness, independence of learning, and student learning outcomes in learning biology.

During this time, the implementation of Plant Morphology and Plant Anatomy lectures are still carried out face-to-face in full, so the need for the application of appropriate learning methods to support lecturers. According to Lalima and Dangwal (2017), The education system is currently in a transition phase, to meet the challenges of expansion and the needs of each individual, it is necessary to utilize technological developments while maintaining the existence of conventional learning. How to teach conventional although there are deficiencies, but can provide a human touch that is needed for the teaching and learning process. Personality and behavior of educators directly affect the character of students. Only face-to-face interactions fulfill affective goals together with cognitive and psychomotor. Based on this, this study aims to determine the effectiveness of blended learning that is implemented in the course of the structure plant development.

## Method

This research method is pre-experiment with the design of One Group Pretest Posttest (Sugiyono, 2014). The research was conducted at the University of PGRI Semarang in the subject of Plant Development Structure material on Leaves, Flowers, and Fruits. The subjects of this study were 32 students the second-semester students of the University of PGRI Semarang in the 2015/2016 academic year. The learning design uses a combination of face-to-face methods with offline teaching materials in the form of flipbooks, online discussions with Facebook groups, and e-assessment with ProProfs applications.

The sample is determined using a purposive sampling technique (Darmadi, 2011). Purposive sampling is taken based on consideration of the academic ability of students of sampling classes who tend to be more homogeneous compared to other classes. The research instrument used in this study was a matter of tests and questionnaires. Test questions to determine the cognitive aspects of students and questionnaires to assess the response of students to learning mix in lectures Plant Development Structure (material leaves, flowers, and fruit). Data analysis of cognitive learning outcomes using a t-test from the results of pre-test and post-test, while the learning response mix in learning in the classroom is then processed data triangulation analysis by conducting interviews with students and theoretical studies.

## Results and Discussion

Based on the questionnaire data given to college students, it was found that college students liked blended learning. Factors influencing these results include because in blended learning (1) it still does not leave direct learning; (2) students feel the benefits by implementing online discussions, (3) students also feel the benefits of variations in learning media with offline electronic teaching materials, and (4) students feel the benefits of implementing e-assessment.

The first factor is that SPT lectures still do not leave face-to-face meetings. We carried out using the field / environmental experience approach because the Plant Development Structure is lecture material based on direct observation of preparations so that the explanation with specific

reasoning is supported by concepts, theories, and facts empirical. The lecture, which is integrated with the practice through direct observation of plants in the natural laboratory of Campus 3 of the University of PGRI Semarang, has seen positive results. This result is consistent with the results of Santiningtyas, Prasetyo, and Priyono (2012) research that the application of inquiry-based outdoor learning has a significant effect on student learning outcomes. Likewise, as stated by Siswati, Herlina, and Budiyanto (2012) that the application of hands-on minds-on with the help of original media can be applied to Spermatophyta material because it can improve student learning outcomes and activities.

Besides, the lecture on Plant Development Structure is also carried out by encouraging college students to think critically, analytically, and correctly in identifying, understanding, solving problems, and applying learning material in daily life. It is reinforced by the results of a questionnaire on how to learn the structure of plant development that students like by having face-to-face meetings with lecturers who explain in front of the class, college students listening, taking notes on lecturers' explanations, and discussions in the classroom amounting to 47% as shown in Figure 1.

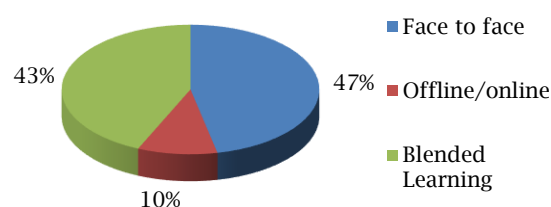


Figure 1. Response college student related to kind learning STP

Based on Figure 1, the results show a good response category from college students to face to face learning. It is consistent with what was conveyed by Syarif (2013) that through face to face learning, the teacher can function himself as an educator and provide direct and expressive motivational encouragement to students.

Learning by using a combination of face-to-face methods with offline teaching materials and online discussions favored by 43% of college students. These results indicate a good response category. College

students like blended learning because lectures carried out face-to-face and supported by the use of online and offline media. It makes it easier to understand the material structure of plant development; the lectures process is more varied and exciting, so college students do not feel bored in learning. Meanwhile, how to study students by reading electronic books (offline) then conducting discussions online and lecturers giving explanations from incomplete student discussions obtained data, 10% of students liked the model. So it was included in the lousy response category. The cause is because they feel insecure if they will argue in discussions that are read by classmates.

In lectures, face to face with the lecturer is carried out by the method of group discussion. Based on the results of the questionnaire obtained, as many as 26.6% of students were pleased, and 53.3% of students were happy with the lectures on Plant Development Structures that done out in groups. The reason is, students understand the lesson better because they can ask questions and cooperate with friends. Also, 13.3% of students find it easier to work on LKM and answer questions. Meanwhile, 13.3% of students feel better because their assignments are lighter. As many as 3.3% of students are bolder in classical discussions because there are friends. In lectures face to face with lecturers, as many as 13.3% of students are less happy/unhappy lectures on Plant Development Structures that done out in groups. The reason is, as many as 6.6% of students cannot concentrate on lessons, and as many as 3.3% feel there is no advantage when studying groups. Based on the results of research [Krismiati \(2013\)](#) proves that the application of learning in groups can improve problem-solving skills.

The second factor influencing the effectiveness of blended learning is that students feel the benefits of implementing online discussions. In this lecture, Facebook is used as an online discussion media (see [Figure 2](#)); thus, learning activities will be more flexible, not focused on classroom activities. Since classroom activities are limited by time, through Facebook Groups, the lecturers and students who are registered in them can interact, discussing some of the questions raised by the lecturers supporting the Plant Development Structure.



Figure 2. Online discussion on Facebook groups.

The results of the questionnaire analysis related to the benefits of learning through online discussions with a Facebook group showed that students felt they had gained experience, as shown in [Figure 3](#).

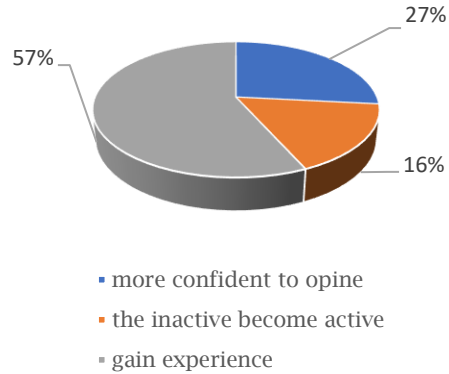


Figure 3. Questionnaire results in the benefits of learning online discussions with Facebook groups

Based on [Figure 3](#), it can be seen that as many as 57% of students feel they have the experience, that as a prospective teacher can later utilize social media as a learning medium in lectures conducted by online discussion. As many as 27% of students feel more confident to express more opinions. While 16% of students feel friends, who are usually not active become more active in their opinions. Based on interview results, it is known that students prefer the time for online discussion outside of lecture hours compared to the hours effectively of lectures, with a note to agree in advance if on certain materials required online discussion. Nevertheless, the online discussion also has the disadvantage of the possibility that online learning can be misused to access other online sites. Hence, students are less focused on discussing the material. Besides, internet connection for online discussions can also be a problem if there is network interference.

According to [Lim \(2010\)](#) Facebook provides instructors opportunities and structures by which students can help and support one another, Some of these include uploading course announcements, announcing events, posting reminders regarding assignments, creating links to educational resources such as video clips and relevant websites as well as facilitating discussions either on the wall or in discussion boards. Facebook provides features that can help students and educators interact with each other. Facilitators can use Facebook in various ways to involve students in the learning process. Some features on Facebook include: task notifications, posting reminders about assignments, creating links such as video clips and relevant websites, and facilitating discussions. The use of Facebook as an online learning media, students, feel they have gained experience as prospective teachers to use social media efficiently, which can be useful as a learning medium that is carried out utilizing online discussion. It is because of some features that are easy to learn and familiar to students so that Facebook can be utilized more than just a friendship. Students also feel more confident to express more opinions and students who are usually not active when in class become more active in opinions when discussing online.

Through the internet, accessing information is very easy to do anytime and anywhere. However, the thing that then needs to be considered is, the information obtained is not structured so that the learning process takes place is not optimal. With the presence of internet-based learning, media is expected so that students can get the maximum learning experience through the learning process structured that can be accessed anytime and anywhere. The most important thing is to remain controlled by the teacher ([Daud & Rahmadana, 2015](#)). The benefits of learning with the internet have also been proven by [Kuswanto and Mustikawati \(2018\)](#) that the use of Facebook as a learning medium can increase student activity and learning outcomes.

The third factor that influences the effectiveness of blended learning is that students also feel the benefits of a variety of learning media with offline electronic teaching materials. This study utilizes a flipbook that is intended to minimize the lack of supporting infrastructure in the

course of Plant Development Structure in the matter of leaves, flowers, and fruit. Flipbook teaching material that displays visuals in the form of clear writing and images and is equipped with audio in the form of instrumental music that is useful for balancing the right and left brain so that it gives a positive influence on learning (see [Figure 4](#)). In line with [Abadiyah, Prihatin and Murdiyah \(2018\)](#) which states that flipbooks are an organization of learning material that contains text, sound, animation, and video. The results of his research show that flipbooks are easy to develop and appropriate for use in learning.



Figure 4. Flipbook SPT cover (up), content (bottom)

College Students think that the flipbook used in learning can balance the right and left brains, as seen in the analysis of student responses to the flipbook in [Figure 5](#).

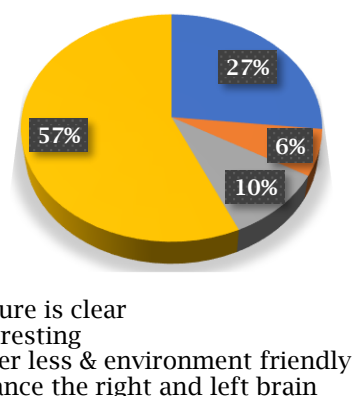


Figure 5. Student responses to flipbook teaching materials

Based on Figure 5, the advantages of students in learning to use offline teaching materials (flipbook) as much as 57% of students feel happy because while reading can simultaneously listen to the music of the instrumental so that it can be useful in balancing the right and left brain. Music simultaneously stimulates the left and right sides of the brain (Wilkinson, 2013). This stimulation can give the impression of relaxing and reduce stress on students. Another advantage of the flipbook is paperless, environmentally friendly, and students enlarge text is more comfortable for reading. Flipbooks, combined with learning models, can have a positive influence on learning outcomes (Andri & Yeni, 2013; Kusuma, Ariyati, & Wahyuni, 2018). However, they still often found computers/laptops that do not support open offline teaching materials such as flipbooks.

Based on these results, it is known there is an increase in learning outcomes, this is because students become more familiar with the blended learning model that combines face-to-face with the supported use of online and offline media. So that the material becomes easier to understand, besides that learning process becomes more varied, engaging, and not weary.

The fourth factor is the effectiveness of blended learning because students feel the benefits of implementing e-assessment with the ProProfs application. The benefits gained by students include showing pictures clearly, getting feedback directly correct answers if the student answers are wrong, obtaining certificates that are equipped with grades. The percentage shows that 60% of students are happy with the feedback from the answers (Figure 6).

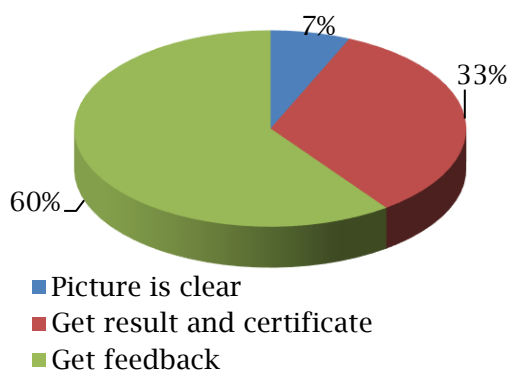


Figure 6. Response to the use of e-assessment with ProProfs

Based on Chikmah (2016), the results show that students' perception of the use of ProProfs as an assessment tool is positive. It is in line with the results of this study that using E-assessment with ProProfs has given students the advantage of being able to get feedback directly right answers if the student answers are wrong. Students can also find out the value directly after completing the questions and get a certificate, besides the test is supported by media that can display images is clearly. Online discussions and online assessments are paperless to provide examples as environmentally friendly teaching materials.

The various factors that play a role in blended learning affect the effectiveness of Plant Development Structure lectures that can be identified through the results of student pre-test and post-test on the material Leaves, Flowers, and Fruits arranged in Table 1.

Table 1. Result pretest and posttest

Categories	Pretest	Posttest
Lowest score	27	47
Highest score	57	87
Average	41,84	70,97

Prerequisite test results in the form of a normality test with Kolmogorov-Smirnov obtained pretest values normally distributed with sig. 0.159 > 0.05 and posttest values are normally distributed with sig. 0.486 > 0.05. In the homogeneity test with the Levene's test, a sig value of 0.081 > 0.05 is obtained so that the homogeneous.

Hypothesis testing using paired samples correlation obtained a correlation of 0.415 with a significance value of 0.018 < 0.05; This states that the correlation between pretest and posttest is significantly related. The results of calculations using Paired Sample T-Test obtained data that the t count of -13,983 with a significance value of 0,000 < 0.05, which means there are differences in learning outcomes before and after learning with blended learning. The difference in average learning outcomes before and after learning with blended learning is -29,125. Thus it can be seen that there are significant differences in the results of the pretest and posttest, and effectiveness is blended learning for the lecture on Plant Development Structure.

## Conclusion

Blended learning combines face-to-face, offline teaching materials, and online assessment results in significant differences in learning outcomes in learning Plant Development Structure. So, it can be concluded that blended learning is effective for learning Plant Development Structure. Implementation of blended learning needs to be supported by a variety of learning resources and readiness of all resources used so that lectures can run optimally.

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