



# A Comparison of Biology Pre-service Teacher Learning Achievement Using Offline and Online Method in Biology Learning Evaluation Course

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**Abstract.** Biology learning evaluation course is a compulsory subject for undergraduate biology education students because it prepares students to design learning assessments when they become teachers later. Regularly, offline learning used discussion and problem-solving methods face-to-face. However, with the pandemic of Covid-19 since 2020, learning was to be online; began after the midterm exam. This study aims to compare the learning outcome of prospective biology teacher students when participating in offline and online learning. This research is quantitative-comparative research which a population is 164 students. Data were analyzed using SPSS with paired sample t-test technique, and used Wilcoxon test (non-parametric test), because the normality test was not met. The results showed a significance value of  $0.328 > 0.050$  which means that  $H_0$  is accepted. To be concluded, there is no difference in the learning achievement of biology pre-service teachers in this course using offline and online methods.

**Keywords:** Learning evaluation · Offline · Online · Student achievement

## 1 Introduction

Biology learning evaluation course is a compulsory subject for undergraduate biology education students. This course in Universitas Negeri Padang consist of essential materials as stated in the syllabus, consist of six aspects, cover: (1) explain the concept of measurement, assessment, evaluation function, and form of assessment; (2) compiling grids and evaluation instruments for aspects of knowledge, attitudes, and skills; (3) analyze evaluation instruments; (4) apply scoring and assessment techniques in the evaluation of learning; and (5) establish minimum completeness criteria based on the curriculum; and (6) explain the concept and application of alternative and authentic assessments [1].

Regularly, offline learning used discussion and problem-solving methods face-to-face, as we know as offline learning. This method is easier to conduct because the

learning makes students engage spontaneously verbally in terms of communication and also a permanent physical environment [2]. With the Covid-19 pandemic at the beginning of 2020, Circular Letter Number 4 of 2020 was issued by the Minister of Education and Culture as an effort to overcome the spread of the virus, namely the Implementation of the Policy for the Implementation of Education During an Emergency. One of the contents of the circular states that learning, which is usually done offline becomes online.

The process of learning has several advantages carried out online such as having a wide range; high flexibility in time; learning materials can be accessed anywhere and anytime; maintaining timeliness in giving assignments or evaluating learning, and requiring more independence and activeness of students in learning. In process of learning, students become motivated to improve their skills in solving problems independently [3].

Nevertheless, In the online learning process, there are several things that become obstacles, that are the limited mastery of information technology by educators and students; there are still inadequate facilities and infrastructure in some areas in Indonesia, limited internet access, and the unprepared provision of a budget regarding internet quotas to meet needs in the online learning process [4]. All of these factors will affect students' learning achievement but do not known yet in the biology evaluation course. Therefore, this study aims to compare the learning outcome of prospective biology teacher students when participating in offline and online learning.

## **2 Biology Evaluation Learning Course**

### **2.1 Course Objectives**

Graduate learning achievement of biology learning evaluation course in Biology Education Program, Universitas Negeri Padang, since 2021, are detailed in three general criteria; attitude, skills, and knowledge. For the attitude aspect, students are asked to fear of God almighty shows an attitude of intelligent character; internalize academic values, norms, and ethics; and demonstrate a responsible attitude towards work in their area of expertise.

Furthermore, in the skills criteria, there are two aspects of skills (general and specific). The general, systematic, logical, critical, and innovative thinking are abilities that must be possessed by students according to their expertise in developing and applying human values; students are also required to be able to show quality, independent, measurable performance so that when there are problems related to the experts, students are able to make the right decisions based on the data and the results of the analysis of the information they have for solving these problems. In specific skills, mastery of key concepts, empirical findings, theoretical perspectives, and historical trends in biology education are specific skills that must be mastered by students; and able to plan, implement and evaluate the process and learning outcomes of high school biology and junior high school science.

Lastly, for the knowledge aspect, the biology learning evaluation course gives the students an outlook on formulating procedural problem solving to act as biology teachers and natural science teachers. This achievement is detailed in five-course learning outcomes as follows: (1) Students have the ability to describe measurements, assessments,

and evaluations in the field of biology at the high school level; (2) able to compile standardized instruments or tests that measure cognitive, affective and psychomotor abilities based on ability levels in Anderson's revised Bloom taxonomy; (3) able to compile HOTS-based assessment instruments integrated with 21<sup>st</sup>-century skills in the form of rubrics to assess work/assignments as an example of assessing the learning process of high school students; (4) able to formulate minimum completeness criteria based on the high school curriculum in biology subject; and (5) able to describe the concept and application of alternative and authentic assessment (Biology Education, 2021).

## 2.2 Offline Learning

The presence of educators in teaching in class is a reliable thing in offline learning. This learning makes students engage spontaneously verbally in terms of communication and also the permanent physical environment [2]. It is easy for educators and students because of the two-way interaction that can be carried out directly. Activities that generate feedback from the learning process such as written tests, presentations, or independent and group work practices can be monitored properly by educators [3].

Face-to-face learning affects the psychological, emotional, and ability to absorb learning materials as well as solutions to existing problems for students [5]. A learning environment that supports the learning process of students is the main thing in offline learning. A suitable learning environment for students can increase enthusiasm and positively influence student learning outcomes because of the motivation to learn.

Offline learning requires more costs in terms of facilities and infrastructure [2], some students have difficulty when they want to ask questions when in class and the use of time is less effective in process of offline learning [6].

Although currently the online learning process has been recognized, alternative processes of learning still need to be prepared in education. This is useful for things that may occur in the future unexpectedly, such as infectious diseases, regional conflicts and natura

I disasters so that offline learning processes are hampered. The learning process that can be prepared to deal with these things is like an online learning process or blended learning [6].

## 2.3 Online Learning

Online learning gives rise to various types of interactions in the learning process because it has accessibility, flexibility, and connectivity from the internet network used [7]. With the internet, online learning is able to bring together educators and students in an effort to make learning interactions [8].

Online learning allows students to listen to the concepts being taught without being in the room and meeting face to face, but still makes it easier for students and educators to interact with the material provided. Online learning can also streamline time in the biology learning process [9] and allow students to increase interactivity and learning efficiency because online learning presents students with opportunities to access more material and communicate [10].

There are four characteristics of internet technology utility in the process of learning, namely: (1) utilizing computers as learning media inside and outside the classroom., (2) utilizing computer networks which are expected to create interactions between educators and students as if carrying out the learning process in the classroom. Class, (3) using teaching materials that are independent and stored on computers so that they can be accessed by educators and students, and (4) requires guidance, one of which is in terms of operating the learning media used [7].

But, there are some weaknesses or obstacles to the effectiveness of this online learning process, namely: (1) the lack of existing networks around educators and students, (2) the availability of learning tools that do not necessarily all have adequate tools, (3) the effectiveness of the online learning process is determined by the unsupportive learning environment, (4) the level of understanding of the material that can be said cannot cover all students due to differences in the learning styles of each student and is considered less accommodating to all needs in the learning process. Online learning [11], (5) there are some students who do not take part in the online learning process because there are many difficulties that educators cannot monitor as a whole, and student learning outcomes have an impact, (6) there is a sense of disinterest and the boredom felt by students during the process of online learning, so students become interested in learning has an impact. This is exemplified by students who do not do the tasks that have been given and are less active in discussions through learning media which will also result in the learning outcomes of these students [7].

### 3 Methods

This research is quantitative-comparative research using saturation sampling with 164 biology education students that have studied biology learning evaluation courses. On the other hand, all of the population becomes a sample.

Data were analyzed using paired sample t-test, which used midterm examination results as the data for offline learning and final examination as the online learning data. Before analyzing the data, we analyzed the normality test using One-Sample Kolmogorov-Smirnov Test, because the sample are  $> 50$ . This analysis is shown in the Table 1.

Based on the Asymp. Sig. (2-tailed) value  $0.000 < 0.05$ , conclude the data is not normal. Hence, the paired sample t-test technique analysis continues using the non-parametric analysis Wilcoxon Test.

### 4 Result and Discussion

Our results differ from some past studies in important ways. Some research report seems considerably more positive offline than the results of online credit in previous randomized controlled trials as displayed in Tables 2 and 3.

Based on the Asymp. Sig. (2-tailed) value  $0.328 > 0.050$ , conclude that the  $H_0$  is accepted.  $H_0$ : there is no difference in the learning achievement of biology pre-service teachers in this course using offline and online methods. This is based on the limitation of this study, which only compares cognitive aspects. And this result points out that the

**Table 1.** One-sample kolmogorov smirnov test

	<b>Unstandardized Residual</b>
N	164
Normal Parameters <sup>a,b</sup> Mean	0.000000
Std. Deviation	11.27881618
Most Extreme Differences Absolute	0.159
Positive	0.104
Negative	-0.159
Test Statistic	0.159
Asymp. Sig. (2-tailed)	0.000c

<sup>a</sup> Test distribution is normal

<sup>b</sup> Calculated from data

<sup>c</sup> Lilliefors Significance Correction

**Table 2.** Wilcoxon signed ranks

	<b>N</b>	<b>Mean Rank</b>	<b>Sum of Ranks</b>
Online-Offline Negative Ranks	75 <sup>a</sup>	56.96	4272.00
Positive Ranks	62 <sup>b</sup>	83.56	5181.00
Ties	27 <sup>c</sup>		
Total	164		

<sup>a</sup> Online < Offline

<sup>b</sup> Online > Offline

<sup>c</sup> Online = offline

**Table 3.** Wilcoxon signed test statistics

	<b>Online-Offline</b>
Z	-0.978 <sup>b</sup>
Asymp. Sig. (2-tailed)	0.328

<sup>a</sup> Wilcoxon Signed Ranks Test

<sup>b</sup> Based on negative ranks

cognitive aspect is not influenced by the method of teaching, but may be affected by many other factors.

The lecture process in the offline biology learning evaluation course refers to the student center. Offline biology learning is carried out with various methods and models so that students are interested and not bored in the process of learning. Students are divided into groups to discuss the learning materials provided by the teacher. Similar to the offline process of learning, online biology learning also refers to a learner-centered learning process. Create discussion groups and on several occasions use virtual meetings such as using zoom cloud meetings or google meet. Even though they use the same

learning focus, these two learning processes have the intensity of time and also the quality of discussion and collaboration between students with different educators and fellow students. This is because the learning process in online learning that occurs depends on the internet network owned by educators and students.

However, this difference in the process of learning has no impact on the cognitive outcomes of students. The results show that statistically, there is no difference in student learning outcomes using offline and online learning methods. However, when viewed from the average score obtained by students, there is a slight difference; the average student learning outcomes in online and offline biology learning have differences, where the average student learning outcomes in offline biology learning are 72.86 and the average student learning outcomes in online biology learning is 75.46. Based on the average data, it can be seen that the online biology learning process has a higher average value on student learning outcomes compared to offline biology learning.

This report shows that the learning process in the biology evaluation learning course has been conducted effectively. Effective online learning must consider many factors such as the educator-student ratio, the role of online educators, the pedagogical abilities of educators, the role of online learners, synchronization, computer network, online communication, the role of online assessment, and sources of feedback from the online learning process [6].

This research finding as found in [8], that overall flexible learning process makes students satisfied. It was also mentioned that what affects student satisfaction with a learning process are the flexibility of time, methods of learning and places during online or online learning [12]. The results of this study also found a unique fact that students felt more comfortable in expressing opinions and questions in the online learning process.

## 5 Conclusion

In a nutshell, this study reports that there is no difference in the learning achievement of biology pre-service teachers in this course using offline and online methods. This achievement is limited in the cognitive aspect; therefore further study can identify the other aspects and also can be conducted to know about students' metacognition to raise this finding.

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