Effect of problem based learning models on student skills in conducting validity and reliability test of objective question

R D Wulaningsih*

Biology Education Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Jakarta (UNJ), Jl. Rawamangun Muka Jakarta Timur, Indonesia

*dewiwulaningsih.ratna@gmail.com

Abstract. Testing the validity and reliability of objective questions on PPEP (Perencanaan, Pengelolaan, dan Evaluasi Pembelajaran/Learning Planning, Management, and Evaluation) courses which is carried out at the Biology Education Program Study FMIPA UNJ demands thorough attention, considering the lecture material in this course is important to provide adequate knowledge for the students as prospective education graduate. Problem Based Learning Model is a cooperative learning model that focuses on student group work in the form of small groups, which consists of four to six people. Students in groups will work together in a positive way and become responsible independently. Data collection using pretest and post-test completed with documentation. The results of this study show that there is an influence of the problem-based learning model on students' skills in testing the validity and reliability of objective questions on PPEP courses.

1. Introduction

Objective tests are often used during examinations that are attended by many people, for example at the time of acceptance of new students. Objective tests, also known as short answer tests, are one of the learning outcomes test models consisting of items that can be answered by testee by selecting one of several possible answers that have been paired on each item; or by writing down the answer in the form of certain words or symbols in the space provided [1].

If a valid word is associated with the test function as a measuring device, then the test can be said to be valid if the test is correct. Valid can measure what must be measured. The word reliability is often translated as stability or consistency. If the term is associated with the function of the test as a measure of the success of student learning, then the learning outcome test can be declared reliable if the results of measurements are made using repeated tests on the same subject, always showing results that remain the same or stable [2].

Objective tests are often used in admission selection tests or public school examinations, it is also easy to check and report the results immediately. Thus, the validity and reliability of important objective test items are studied by students in PPEP (Perencanaan, Pengelolaan, dan Evaluasi Pembelajaran/Planning, Management, and Learning Evaluation) subjects, because PPEP can provide adequate knowledge and skills to prospective teachers graduating from the Biology Education Study Program, Faculty of Mathematics and Science Alam, Jakarta State University (FMIPA UNJ).

Research on Comparison of Problem Based Learning Models (PBL) compared to traditional learning on student knowledge, especially on the concepts, principles, and procedures of electrical technology...
has been carried out by Masek and Yamin at Universiti Tun Hussein On Malaysia [3]. The results of this study indicate that the problem-based learning model is better than the traditional learning model. Therefore, a problem-based learning model will be conducted in the PPEP course at FMIPA UNJ.

The problem is whether there is an influence on the PBL model on students' skills in testing the validity and reliability of objective test questions in the subjects of planning, management and learning evaluation in the FMIPA UNJ Biology Education Study Program?

The purpose of this study is to prove that there is an influence of PBL models on students' skills to test the validity and reliability of objective test questions in the process of planning, management, and evaluation of learning in the Biology Education Study Program. FMIPA UNJ.

2. Research methods
This research was conducted in Class A which took PPEP courses in the 107th semester, which was 38 students. The sampling technique was done randomly, taking the number of samples using the Taro Yamane formula with a margin of error set of 5% or 0.05, the number of samples was 35 [4,5].

To measure the skills of students to know about the validity and reliability of objective items in PPEP courses using a limited essay test [6]. Students are asked to make objective test questions and calculate their validity and reliability. To measure the strength and direction of the relationship between one continuous variable and one dichotomous variable, Point-biserial correlation is used. This is a special case of Pearson's product-moment correlation, which is done when it has two continuous variables, whereas in this case one variable is measured on a dichotomous scale [7]. Reliability test using Kuder Richardson (KR) 20 [8].

The steps of the PBL model are as follows [9]:
   a. Student orientation on problems. How to make a good objective test question?
   b. Organizing students to study. Teaching material is then sorted.
   c. Guide the investigation of small groups of individuals and groups, consisting of four to six people.
      Each group is trained to make objective test questions and to be discussed with their validity and reliability and tested.
   d. Develop and present the work of students per group.
   e. Analyze and evaluate the problem-solving process

The hypothesis proposed is as follows:
   H₀: μₓ = μᵧ (there is no difference in students' skills in testing the validity and reliability of objective items before and after lectures with a problem-based learning model).
   H₁: μₓ ≠ μᵧ (there are differences in student skills in testing the validity and reliability of objective items before and after lectures with problem-based learning models).

3. Results
Tasks given to students to make objective test questions and test the validity have been done quite well by students. Validity includes face validity, content validity, construct validity, and predictive validity criteria. Reliability of internal consistency can also be done well by students.

The results of the pre-test validity and reliability of the item objective questions from 35 students showed the minimum value was 1 and the maximum value was 10, with an average value of 4.5714 and a range of 9 values, and the total value of 160. While the post-test value showed a minimum value of 2 and the maximum value is 26 with an average of 14.6 and a range of values of 24, and the total value of 511. Based on the results of data analysis on the Kolmogorov-Smirnov One-Sample Pre-test and Post-Test Student, the data were normally distributed, with a significance value > 0.05 [10].

Hypothesis testing uses SPSS 20.0 (Table 1), probability value or Sig. (2-tailed) < 0.05. Similarly, it is known that t count is -8.556 < t table (0.05) which is -2.032, so reject H₀ and accept H₁. This shows that there are significant differences between the results of the pre-test and post-test. It means that there is the influence of the problem-based learning model on students' skills to test the validity and reliability of objective items in the PPEP course.
4. Discussion

Objective test items made by students especially on face validity, content validity and construct validity have shown good results. Face validity is a subjective assessment of the operationalization of the construct. The face of validity is the extent to which a measure seems to be related to a particular construct, in the assessment of non-experts such as test takers and representatives of the legal system. That is, the test has face validity if the content appears relevant to the person taking the test. It evaluates the appearance of the questionnaire in terms of feasibility, readability, consistency of style and format, and clarity of the language used [11]. Content validity uses a literature review to extract related items. The construct of validity refers to how well you translate or change concepts, ideas, or behaviors that constitute construction into a functioning and operating reality, operational. Criterion predictive validity is the extent that a measure predicts another measure uses point biserial correlation [12]. Reliability Internal consistency is the level of measurement a phenomenon provides stable and consistent results using the Kuder Richardson (KR) 20 test.

The results of this study indicate that there is the influence of the problem-based learning model on students' skills to test validity by using biserial point correlation and objective item reliability test with KR 20 on PPEP subjects in the Biology Education Study Program FMIPA UNJ. This is in line with Ibrahim et al. in his research has shown the effectiveness of problem-based learning in the acquisition of knowledge, soft skills in basic and preclinical sciences in students at Bisha University, Faculty of Medicine (UBCOM) in Saudi Arabia [13]. Yanti's research also shows a similar thing, namely the application of problem-based learning models can improve critical thinking skills in students of Mathematics education study programs, who take Basic Physics subjects at Nahdatul Ulama University in Lampung [14]. Problem Based Learning also affects the level of creative thinking in Sumbermalang 1 High School, especially in the Human Motion System material [15]. Thus the problem-based learning model can improve student learning skills, especially in testing the validity and reliability of PPEP subjects.

5. Conclusion

Based on the research that has been done, it can be concluded that there is the effect of problem-based learning models on student skills in conducting validity and reliability test of objective question in the PPEP subject in the Biology Education Study Program FMIPA UNJ.

References

[1] Sudijono A 2003 Pengantar Evaluasi Pendidikan (Penerbit PT Raja Grafindo, Jakarta)
[2] Arikunto S 2003 Dasar-dasar Evaluasi Pendidikan (Penerbit Bumi Aksara, Jakarta)
[3] Masek A and Yamin S A 2012 Comparative Study of the Effect of Problem Based Learning and Traditional Learning Approaches on Students’ Knowledge Acquisition International Journal Engineering of Education 28(5) pp 1161-1167
[4] Work T and Mauffette Y 2018 Random allocation of students into small groups in problem-based learning can create significant between-group variation during the assessment process Journal of Problem Based Learning in higher education
[5] Riduwan 2005 Belajar Mudah Penelitian Untuk Guru, Karyawan dan Peneliti Pemula (Bandung: Alfabet)
[6] Yoon H B, Park W B, Myung S J, Moon S H, Park J B 2018 Validity and reliability assessment of a peer evaluation method in team-based learning classes *Korean J Med Educ* 30(1) pp 23–29

[7] Grande T 2015 *Point-Biserial Correlation with Assumption Testing in SPSS* [Online] Retrieved from: https://www.youtube.com/watch?v=lxr88zr9t8Q

[8] Grande T 2015 *Conducting a Kuder-Richardson 20 Test (KR-20) in SPSS* [Online] Retrieved from: https://www.youtube.com/watch?v=wwetiKx2QDU

[9] Massofa 2013 *Model pembelajaran berbasis masalah (problem based learning).* http://massofa.wordpress.com/2013/05/27/model-pembelajaran-berbasis-masalah-problem-based-learning/

[10] Zain I 2013 *Pengantar Uji Statistika Parametrik dengan menggunakan SPSS* [Online] Retrieved from: https://www.youtube.com/watch?v=Tw72pH1GnW0

[11] Shuttleworth M 2019 *Types of validity* [Online] Retrieved from: https://explorable.com/types-of-validity

[12] Tahedoost H 2016 Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. January 2016 *SSRN Electronic Journal* 5(3) pp 28-36

[13] Ibrahim M E, Al-Shahrani A M, Abdalla M E, Abubaker I M, Mohamed M E 2018 The Effectiveness of Problem-based Learning in Acquisition of Knowledge, Soft Skills During Basic and Preclinical Sciences: Medical Students’ Points of View *Acta inform med Journal* Jun 26(2) pp 119–124

[14] Yanti F A 2016 *Penerapan model pembelajaran berbasis masalah untuk meningkatkan keterampilan berpikir kritis* (Universitas Nahdlatul Ulama Lampung, Lampung Timur)

[15] Utomo T, Wahyuni D and Hariyadi S 2014 Pengaruh Model Pembelajaran Berbasis Masalah (*Problem Based Learning*) Terhadap Pemahaman Konsep dan Kemampuan Berpikir Kreatif Siswa (Siswa Kelas VIII Semester Gasal SMPN 1 Sumbermalang Kabupaten Situbondo Tahun Ajaran 2012/2013) *Jurnal Edukasi UNEJ* 1(1) pp 5-9