

Conference Paper

Problem-based Blended Learning Using Video Tutorial in Accordance with Student Ability

Budi Sudrajat and Embun Fajar Wati

Universitas Bina Sarana Informatika, Jakarta

ORCID:*Budi Sudrajat: <https://orcid.org/0000-0002-3021-8751>***Abstract**

Blended learning as a teaching methodology has been widely used in the world of education. It can be used in practicum courses by combining several models so that students can more easily understand the material. Problem-based learning can be a means for students to be able to think critically. In this study, problem-based learning is combined with a video tutorial to form a blended learning model for computer programming practicum teaching that requires instructions and tutorials on the application usage as well as case studies. This model is also combined with the dissemination of material in the form of video tutorials and problem-based questions according to students' ability. The ability of students was then measured from the workmanship of the question given at the beginning of the study. This type of research uses a modified version of the concept of Ibrahim and Nur. Data were collected through documents and via observations. The result of this study showed that a blended learning model helped in teaching practicum courses with a programming video tutorial containing instructions was uploaded on YouTube, where it was available for the students to re-refer the material if they were unable to understand it at the first attempt.

Keywords: programming, teaching, video tutorial, blended learning, practicum

Corresponding Author:

Budi Sudrajat

budi.bst@bsi.ac.id

Published: 1 March 2021

Publishing services provided by
Knowledge E

© Budi Sudrajat and Embun

Fajar Wati. This article is distributed under the terms of the **Creative Commons****Attribution License**, which

permits unrestricted use and redistribution provided that the original author and source are credited.

Selection and Peer-review under the responsibility of the ISOLEC Conference Committee.

1. Introduction

Online system born out of technological advances benefits the world of education. The application of Blended Learning is generally able to improve the result of the learning process by changing learning habits and methods in many countries (Chaeruman, Wibawa, & Zulfiati Syahrial, 2018). The use of technologies is ordinarily used for students learning and peers interaction outside of class, especially for online discussion and homework submission. This method emphasizes that learning activity should not only occur in the classroom but also outside of the class through online media (Zainuddin & Keumala, 2018). Many successful studies in blended learning showed the significance



of reasonable and systemic conception to overcome the limitations of face-to-face and online learning (Zhonggen & Yuexiu, 2015).

One teaching method that can be combined with blended learning is problem based learning (PBL). In the new normal period, blended can use the method of collaboration between online-based teaching media (WBL) and problem based learning (PBL) teaching methods. In addition, the PBL designed a learning atmosphere to solve problems both individually and in groups. By engaging students in solving problems that have been conditioned in such a way, then the learner will think to the maximum and activate his potential so that the learning process is more alive. Educators both teachers and lecturers act as mentors and facilitators during the learning activities (Sujatmika, 2016).

PBL will be more interactive when combined with a video tutorial containing instructions on how to use. Effective use of video as an educational tool is enhanced when instructors consider three elements: how to manage cognitive load of the video; how to maximize student engagement with the video; and how to promote active learning from the video (Brame, 2016). One of the advantages of making teaching videos in the form of tutorials is the support of regular students by giving them the opportunity to recover lectures lost due to forced or elective absence (Ronchetti, 2010). Through a survey set out to a group of university students in a computer based course, this research reports the use and beliefs of using video instructions as a tool for learning that transcends the classroom. Findings show that students will refer to video instructions first before attempting any other form of online instruction (Chan, 2010). Students understood the content better, enjoyed the self-directed learning and doing things independently (Banyen, Viriyavejakul, & Ratanaolarn, 2016).

Student ability is one of the pedagogy aspects that should be considered in education. The fact that in a course or seminar room there are novices and people with experience in the area of study, raises some problems for the teacher (Kelemen, 2014). Learning outcomes assessment should be undertaken by an educator, not only for the sole purpose of assigning grades in student report cards, but also can be used for the purpose of mapping the ability of learners in learning a subject (Yurnetti, 2017).

Based on the background described, it is very important to make learning blended into the practical courses of programming majoring in informatics engineering with collaboration between problem based and video tutorials in accordance with the ability of students. So it involves students to think critically and easily understand the video tutorial stipulated according to the division of the group.

2. Method

The research method used is Pre-Experimental or pseudo research because this study does not use control classes. The research design used is one group pre-test–post-test (Aprilia & Mulyaningsih, 2014). This design describes the class stage that the experiment was immediately given starting from the pre-test, then given treatment with problem-based models and video tutorials to the post-test that can be seen in table 1 (Prabowo, 2011).

TABLE 1: Research design.

Class	Pre-test	Treatment	Post-test
Experiment	U ₁	L	U ₂

The Figure 1 model blended above was created by the author for this research adopted from (Ibrahim & Nur, 2000) with the addition of ability test and video tutorial.

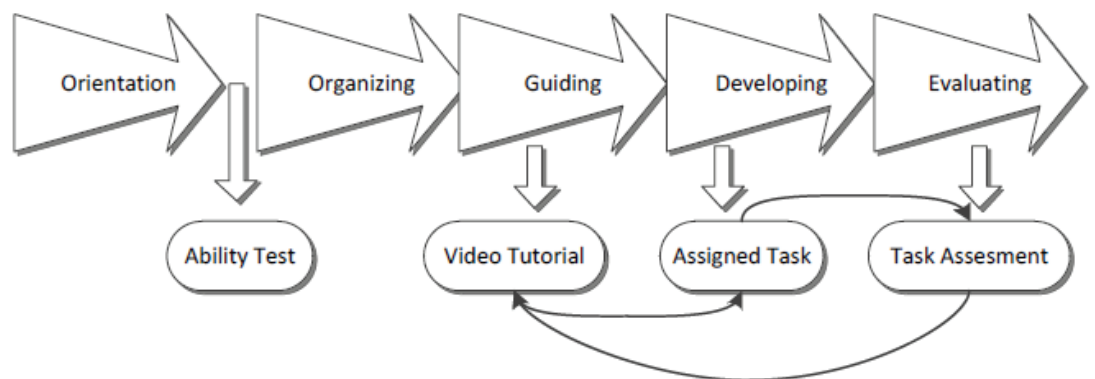


Figure 1: Blended problem-based and video tutorial model.

3. Finding and Discussion

Informatics Engineering is one of the majors of computer science that has characteristics such as polytechnic majors. Blended learning can be applied in Polytechnic, but a scheme is needed to formulate the correct instructional model (Dewi, Ciptayani, Surjono, & Priyanto, 2018). Similarly, the department of informatics engineering can use blended learning modelled with several teaching methods in order to convey materials in theory and practicum so that it can be accepted and understood by students. Research form (Banyen et al., 2016) confirms that the Thai university undergraduate students were satisfied with the blended learning model which was due to the change in the learning

system as well as being tasked with interesting and challenging computer based lessons outside class.

Blended learning can be more interactive by merging with problem based. The Problem Based Learning model is a learning model designed to solve the problems presented (Hamdani, 2015). The course is designed to require students to work in small collaborative groups using problem solving activities to develop topic understanding (Taradi, Taradi, Radic, & Pokrajac, 2005). Learning involves two types of interaction critical in many types of learning, interaction with content and interpersonal interaction, we made efforts to facilitate both types of interaction throughout our course (Hamdani, 2015).

The study with the limited facilities owned by vocational colleges, it required the innovation in the learning process in order to run effectively and efficiently. One alternative that can be taken into consideration is by designing ICT-based learning process (Dewi et al., 2018). In the study (Saharsa, Qaddafi, & Baharuddin, 2018) which combined problem based learning with video based laboratory resulted in increased understanding among students taught using problem based learning models assisted by Video Based Laboratory and students who were not taught using problem based learning models assisted by Video Based Laboratory. Video media is effectively used as learning media of competence in vocational education related to practicum (Nurhayati, Khumaedi, & Yudiono, 2018).

Here are the stages in the learning process that correspond to blended learning that has been modelled with problem based and video tutorials.

The 1st and 2nd meeting at the blended model stage will be conducted pre-test in the form of practical tests of programming languages that have been taught in the previous semester. The sample was taken as many as 25 students of STIKOM CKI Cengkareng in the course of J2ME Programming.

The student's ability was measured not from how much he answered correctly but measured by the difficulty of the exam. Item difficulty may be defined as the proportion of the examinees that marked the item correctly (BOOPATHIRAJ & CHELLAMANI, 2013). In the table 3, the results are visible at the test stage. X is the number of students who answer questions correctly. The most answered question is question number 1 and the least answered question is question number 8. Seen in table 3, question no. 8 has a difficulty level of $p_i = 0.64$ with moderate category (not difficult and not easy) (Kholis, 2017).

In addition to having a medium difficulty level, question number 8 also has a different power in the good level of 0.42 compared to other questions (Solichin, 2017).

TABLE 2: Blended model stages.

Stages	Method	Description	Media	Meeting
Pre-test	Giving about the practice that has been taught in the previous semester	Done 2 pre-tests of VB.Net	Google Classroom	1,2
Orientation	Explanation and introduction material	Explanation of theory, installation, and how to use the application	Google Classroom and YouTube	3,4
Testing	Ability Test	Multiple choice questions	Google Classroom	5
Organizing	Grouping	Based on the ability test will be divided into 3: Beginner, Intermediate, Advance		6
Guiding	Video tutorial 1 by group	Video-friendly case studies	Google Classroom and YouTube	7
Developing	Assigning task 1 according to video	Group case studies		8
Evaluating	Task collection	Task assessment		9
		Discussion and repair		10
Guiding	Video tutorial 2 by group	Video-friendly case studies	Google Classroom and YouTube	11
Developing	Assigning task 2 according to video	Group case studies		12
Evaluating	Task collection	Task assessment		13
		Discussion and repair		14

Item discrimination or the discriminating power of a test item refers to the degree to which success or failure on an item indicates possession of the ability being measured (BOOPATHIRAJ & CHELLAMANI, 2013). The group formed as many as 3, namely expert, intermediate and beginner with beginner group is a group that cannot answer question number 8.

After the treatment is arranged on the blended model table, the test results can be seen in the pre-test and post-test tables. Based on the pre-test calculation of the normality test by using One-Sample Kolmogorov-Smirnov Test with MS. Excel, the value of D_{max} is $0.113 < D_{table} 0.264$. As for post-test has a value of $D_{max} 0.167 < D_{table} 0.264$. So, it can be concluded that the pre-test and post-test data were normally

TABLE 3: Difficulty level and power difference.

Question	X	Pi	D
q1	25	1	0
q2	24	0.96	0.083
q3	20	0.8	0.417
q4	20	0.8	0.417
q5	21	0.84	0.333
q6	20	0,8	0.417
q7	19	0.76	0.34
q8	16	0.64	0.429
q9	18	0.72	0.263
q10	19	0.76	0.5

distributed (Nurhayati et al., 2018). The final results showed an increase in scores in the expert group of 7 out of 8 students (88%), the intermediate group of 6 out of 8 students (75%) and beginner groups of 8 out of 9 students (89%). Based on the average obtained from the pre-test and post-test results, the percentage increase can be seen in the following table 4 and Figure 2.

TABLE 4: Pre-test and post-test ascension results.

Number	Group	Pre-test	Post-test	% Improvement
1	Beginner	69,77778	79,33333	10%
2	Intermediate	73	82,875	10%
3	Expert	68,875	79,625	11%

Seen in the Figure 2, the increase was successful in all groups even though the percentage was not large, which is about 10% - 11%. But the blended model used is quite successful in J2ME programming practical courses.

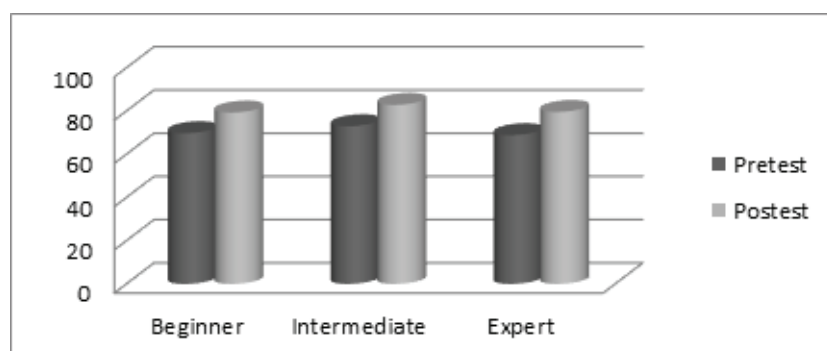


Figure 2: Pre-test and post-test increase diagram.

4. Conclusion and Suggestion

The selection of the right teaching methods in practicum courses that require fewer theories and more practice is a very important factor in the success of learning. Students can easily learn tutorials taught through repeatable videos. The ability of students is also trained because they are used to solving problems based. The use of blended models between problem based and video tutorials in practical programming courses provides a change to the increase in the value of pre-test and post-test results by 10% - 11%. In the next research will be developed research on practicum teaching with animated videos with regard to aspects of student engagement.

References

- [1] Aprilia, L. and Mulyaningsih, S. (2014). Penerapan Perangkat Pembelajaran Materi Kalor Melalui Pendekatan Saintifik Dengan Model Pembelajaran Guided Discovery Kelas X Sma. *Jurnal Inovasi Pendidikan Fisika (JIPF)*, vol. 3, issue 3, pp. 1–5.
- [2] Banyen, W., Viriyavejakul, C. and Ratanaolarn, T. (2016). A Blended Learning Model for Learning Achievement Enhancement of Thai Undergraduate Students. *International Journal of Emerging Technologies in Learning (IJET)*, vol. 11, issue 4, pp. 48–55.
- [3] Boopathiraj, C. and Chellamani, D. K. (2013). Analysis of Test Items on Difficulty Level and Discrimination Index in the Test for Research in Education. *International Journal Of Social Sciences & Interdisciplinary Research*, vol. 2, issue 2, pp. 189–193.
- [4] Brame, C. J. (2016). Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content. *CBE—Life Sciences Education*, issue 15, pp. 1–6, doi: **10.1187/cbe.16-03-0125**.
- [5] Chaeruman, U. A., Wibawa, B. and Syahrial, Z. (2018). Creating a Blended Learning Model for Online Learning System in Indonesia. *International Journal of Engineering & Technology*, vol. 7, issue 3.36, pp. 156–159, doi: **10.14419/ijet.v7i3.36.29098**.
- [6] Chan, Y. M. (2010). Video Instructions as Support for Beyond Classroom Learning. *Procedia - Social and Behavioral Sciences*, Volume 9, pp. 1313–1318.
- [7] Dewi, K. C., et al. (2018). Study of Instructional Model on Blended Learning in Polytechnic. *Cakrawala Pendidikan*, vol. 37, issue 2, pp. 270–281.
- [8] Hamdani, A. R. (2015). Pengaruh Blended Model Problem Based Learning Terhadap Kemampuan Pemecahan Masalah Dan Pemahaman Konsep Siswa Pada Materi

- Daur Air. *Jurnal Pendidikan Guru Sekolah Dasar*, issue 1, pp. 48–66, **doi: 10.36989/didaktik.v1i1.11**.
- [9] Ibrahim, M. and Nur, M. (2000). *Pembelajaran Berbasis Masalah*. UNESA University Press, Surabaya, Indonesia.
- [10] Kelemen, G. (2014). Specific Method for Increasing Learning Abilities in Students. *Procedia - Social and Behaviour Sciences*, issue 116, pp. 4505–4510.
- [11] Kholis, R. A. N. (2017). Analisis tingkat kesulitan (difficulty level) soal pada buku sejarah kebudayaan Islam kelas 8 Kurikulum 2013. *Penelitian Ilmiah Intaj*, vol. 1, issue 2, pp. 93–113.
- [12] Nurhayati, I., Khumaedi, M. and Yudiono, H. (2018). The Effectiveness of the Use of Video Media on Learning on the Competence of Scalp and Hair Care of Vocational High School Students of Beauty Department. *JVCE (Journal of Vocational Career Education)*, vol. 3, issue 1, pp. 66–72.
- [13] Prabowo, P. (2011). *Metodologi Penelitian (Sains dan Pendidikan Sains)*. Surabaya: Unesa University Press.
- [14] Ronchetti, M. (2010). Using Video Lectures to Make Teaching More Interactive. *International Journal of Emerging Technologies in Learning (IJET)*, issue 5, pp. 45–48, **doi: 10.3991/ijet.v5i2.1156**.
- [15] Saharsa, U., Qaddafi, M. and Baharuddin, B.(2018). Efektivitas Penerapan Model Pembelajaran Problem Based Learning Berbantuan Video Based Laboratory Terhadap Peningkatan Pemahaman Konsep Fisika. *Jurnal Pendidikan Fisika*, vol. 6, issue 2, pp. 57–64.
- [16] Solichin, M. (2017). Analisis Daya Beda Soal, Taraf Kesukaran, Validitas Butir Tes, Interpretasi Hasil Tes Dan Validitas Ramalan Dalam Evaluasi Pendidikan. *Dirasat*, vol. 2, issue 2, pp. 192–213.
- [17] Sujatmika, S. (2016). Pengaruh Metode Pembelajaran Problem Based Learning Terhadap Prestasi Belajar Ditinjau Dari Gaya Belajar Dan Kemandirian. *Jurnal Sosiohumaniora*, issue 2, pp. 116–123, **doi: 10.30738/sosio.v2i1.494**.
- [18] Taradi, S. K., *et al.* (2005). Blending Problem-Based Learning with Web Technology Positively Impacts Student Learning Outcomes in Acid-Base Physiology. *Advances in Physiology Education*, issue 29, pp. 35–39, **doi: 10.1152/advan.00026.2004**.
- [19] Yurnetti, Y. (2017). Analysis of Student Learning Ability in Science Teaching based on Mid Semester Examination. *Journal of Physics: Conference Series*, Volume 895, International Conference on Mathematics and Science Education (ICMScE) 24 May 2017, Bandung, Indonesia.

- [20] Zainuddin, Z. and Keumala, C. M. (2018). Blended Learning Method within Indonesian Higher Education Institutions. *Jurnal Pendidikan Humaniora*, vol. 6, issue 2, pp. 69–77.
- [21] Zhonggen, Y. and Yuexiu, Z. (2015). Blended Learning over Two Decades. *International Journal of Information and Communication Technology Education*, vol. 11, issue 3, pp. 1–19, **doi: 10.4018/IJICTE.2015070101**.