24 (3), 2023, 710-716

Jurnal Pendidikan MIPA

e-ISSN: 2685-5488 | p-ISSN: 1411-2531

http://jurnal.fkip.unila.ac.id/index.php/jpmipa/

Efectivity of a Hybrid Classroom-Based Reflective Microlearning Model for Prospective Physics Teachers

Melly Ariska , Hamdi Akhsan, Sudirman, Azizah Putri Berimah, & Ade Kurniawan

Department of Physics Education, Sriwijaya University, Indonesia

Abstract: Hybrid classes is combination of face-to-face learning and online learning, where some students attend physical classes while other take lessons online. This research aims to produce a reflective micro-learning model in hybrid classes that is valid, practical and effective for prospective Physics teachers. modifications to the Plomp model produced reflective Micro Teaching tools based on hybrid classes in the form of RPS, SAP, teaching materials and assessment instruments. Based on the N-Gain value in the Pre-Test and Post-test results, the Offline learning mode is 0.0010 (0.1%) and Online is 0.0392 (3.92%) Judging from the N-Gain value category and Effectiveness Interpretation Category means both learning modes are in the low and ineffective category. Online learning using Phet Colorado media has a greater N-Gain value so it can be concluded that the online learning mode using Phet Colorado is more effective than the offline learning mode using equipment in the Physics Laboratory.

Keywords: reflective micro learning, hybrid classes, micro teaching

Abstrak: *Kelas hibrida mengacu pada kombinasi pembelajaran tatap muka dan pembelajaran daring, di mana sebagian siswa hadir di kelas fisik sementara siswa lainnya mengikuti pelajaran secara daring. Penelitian ini bertujuan menghasilkan model pembelajaran mikro reflektif pada kelas hybrid yang valid, praktis, dan efektif untuk calon guru Fisika. Penelitian pengembangan dengan modifikasi model Plomp menghasilkan perangkat pembelajaran Micro Teaching reflektif berbasis kelas hybrid berupa RPS, SAP, bahan ajar dan instrumen penilaian. Berdasarkan nilai N-Gain pada hasil Pre-Test dan Post test moda pembelajaran Luring adalah 0,0010 (0,1%) dan Daring adalah 0,0392 (3,92%) Dilihat dari kategori nilai N-Gain dan Kategori Tafsiran Efektivitas N-Gain maka kedua moda pembelajaran berada pada kategori rendah dan tidak efektif. pembelajaran Daring dengan menggunakan media Phet Colorado memiliki nilai N-Gain yang lebih besar sehingga dapat disimpulkan bahwa moda pembelajaran daring dengan menggunan Phet Colorado lebih efektif dibandingkan dengan moda pembelajaran luring dengan menggunakan peralatan pada Laboratorium Fisika.*

Kata kunci: *mikro reflektif, kelas hybrid, pembelajaran mikro*

▪ INTRODUCTION

National education functions to develop abilities and shape the character and civilization of a nation with dignity in order to educate the nation's life. Meanwhile, the purpose of national education is to develop the potential of students to become human beings who are faithful, devoted to God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. The functions and objectives of national education are in accordance with Law No. 20/2003 on the National Education System. The mandate of the law explains that education should not only produce intellectually intelligent people, but should also develop their character. Professional teachers are needed and have a vital role to succeed the goals of national education (Ariska et al., 2023).

Melly Ariska
*Email: mellyariska@fkip.unsri.ac.id

DOI: http://dx.doi.org/10.23960/jpmipa/v24i3.pp710-716
Received: 12 November 2023
Accepted: 26 November 2023
Published: 30 November 2023

Professional teachers based on the Teachers and Lecturers Law Number 14 of 2005 article 10 must master four competencies, namely: pedagogical competence, namely the ability to manage learning (Liakopoulou, 2011); professional competence, namely having knowledge, skills, and attitudes that are able to support the responsibility of the profession (Kunter et al., 2013); personality competence, which is the ability of individuals who reflect a stable, wise, noble personality, by acting in accordance with religious, legal, and social norms; and social competence, which is the ability to be able to interact both within the scope of the community related to their profession and a more general community (Langeveld, Gundersen, & Svartdal, 2012). Teacher competence can also be interpreted as knowledge, skills, and attitudes that can be used as a basis for control related to teacher work and expressed through actions (Kunter et al., 2013).

Professional teachers cannot be obtained simultaneously, but also need to be prepared starting from lectures as prospective teachers (Purnomo, 2017). Reflection in the context of learning formulated by Boud (Boud, Keogh, & Walker, 1989) is an intellectual and affective activity to explore experiences in achieving new understandings and appreciations. Reflective learning requires learners to study what they are facing, assume, assess, behave, and apply their understanding (Putra, 2016) (Suharna, 2013).

Reflective learning is very appropriate if it is implemented in the Micro Teaching course of Physics Education Study Program, FKIP Sriwijaya University, because prospective teacher students are required to apply the four teacher competencies in small-scale teaching practice. Micro Teaching requires students to reflect, because students as prospective teachers have an obligation to evaluate and reorganize their teaching skills so that the teaching-learning process can be carried out optimally (Insuasty & Castillo, 2010).

Seeing this problem, it indicates that in the Micro Teaching course, reflective learning tools are needed by implementing See me teach as a manifestation of the vision of the Physics Education Study Program at FKIP Sriwijaya University, so that it can create professional prospective Physics teachers. Based on this background, it is necessary to develop reflective learning tools for Micro Teaching courses based on hybrid classes to create professional Physics teacher candidates.

▪ METHOD

This research is development research which aims to develop a Reflective Micro Teaching learning tool based on offline classes that is simultaneous with online classes using zoom that is valid, practical, and effective to produce professional Physics teacher candidates in the Physics Education Study Program, FKIP, Sriwijaya University. The development model design used is the implementation of Plomp development (Nurdianah and Asmah 2021), namely initial investigation stage, design stage, realization stage, testing, evaluation and revision stage, wide implementation. The testing stage was carried out on 26 ninth grade students at Srijaya Negara Middle School.

The initial investigation stage aims to reflect on the Micro Teaching course to find problems, determine solutions, namely hybrid class-based reflective learning, analyze and prepare relevant theories that support research (reflective model, hybrid class, professional teacher). The design stage activity is designing hybrid class-based reflective learning tools to produce professional Physics teacher candidates. The learning tools developed include semester learning plans (RPS), lecture teaching units (SAP), teaching

materials, Micro Teaching (Professional Teacher) assessment instruments. Reflective learning tools were developed by implementing Context, Experience, Reflection, Action and Evaluation activities, as well as applying Islamic values and local culture. The activity in the realization stage is to create a hybrid class-based reflective learning tool in accordance with the design plan to create professional Physics teacher candidates. The hybrid class-based reflective learning tools including RPS, SAP, teaching materials, assessment instruments that have been realized are then called prototype I.

The test, evaluation and revision phase activities are tests of validity, practicality and effectiveness through several stages of activity. First, validate prototype I with 3 validators to test its validity and practicality, by filling in a validation questionnaire instrument, then analyze the validation results to determine the validity and practicality of prototype I. It is said to be valid and practical if the validation score is in the following categories:

Tabel 1. Assessment categories of device validation instrument

Values Interval	Categories
$1.00 \leq x \leq 1.80$	Not Good
$1.80 \leq x \leq 2.60$	Less Good
$2.60 \leq x \leq 3.40$	Good Enough
$3.40 \leq x \leq 4.20$	Good
$4.20 \leq x \leq 5.00$	Very good

If the device is valid and practical then the trial will continue, if not then it must be revised or rearranged for revalidation. The hybrid classroom-based reflective learning device which has been revised from the results of validity and practicality tests is hereinafter called Prototype II. Trial I is practicing reflective micro learning in a hybrid physics class by applying Context, Experience, Reflection, Action and Evaluation activities, as well as implementing hybrid-based physics learning in Micro Teaching using prototype II in real micro teaching classes (offline). Micro Teaching observation assessments during learning are carried out using instruments with teacher professional indicators, which will be used to test effectiveness. After learning, lecturers as practitioners are asked to fill out a reflective learning response questionnaire based on hybrid classes, to complete the practicality test. Analysis of trial results I analyzed Micro Teaching lecturers' response data on reflective learning to complete the practicality test with an average score above 4.20, good or very good criteria. Another analysis carried out at this stage is testing the effectiveness of hybrid class-based reflective learning tools by looking for N-Gain on students' post test and pre test scores with a test instrument in the form of 10 multiple choice questions, as for the equation to obtain N-Gain from the pre test results and The student's post test is as follows: The effectivity score is in the following categories:

$$N - Gain = \frac{Spost - S\,pre}{Smaks - Spre}$$

Tabel 2. Categories of device effectivity

Values Interval	Categories
0.70 < (g)	High
0.30 ≤ (g) ≤ 0.70	Medium
(g) < 0.30	Low

The instrument test consists of 10 multiple choice questions and is first tested for normality and homogeneity. From the results of trial I with practicality and effectiveness tests, if the results meet the established criteria then the hybrid class based reflective learning device is said to be valid, practical and effective and with the hybrid class based reflective learning device said to be valid, practical and effective it can help create candidates professional physics teacher. If the results do not meet the specified criteria, revisions must be made and a second trial must be carried out.

The broad implementation phase aims to widely disseminate hybrid classroom-based micro-reflective learning tools that have been proven valid, practical and effective in producing professional Physics teacher candidates to a wide audience. Due to the limitations of researchers, the extensive implementation stage will be carried out in subsequent research.

▪ RESULT AND DISSCUSSION

The research began by giving an initial assessment or pretest in the form of ten multiple choice questions with Ohm's Law material and the characteristics of resistance in series and parallel circuits to class nine students at Srijaya Negara Junior High School, the pre-test results were obtained as follows : After the pre-test, learning is carried out separately, namely offline and online. Offline learners are in class directly, and online learners follow learning through the Zoom Meeting application supervised by educators. After the provision of material about Ohm's Law and the characteristics of resistance in series and parallel circuits has been carried out, students are then invited to carry out practicum on the material that has been taught. Practicum is also carried out separately, namely offline and online with different LKPD and media. Offline students are invited to carry out practicum in the Physics laboratory using real practicum tools while online students carry out practicum in the multimedia laboratory using phet cholorado. In this practicum activity, the steps and also the circuits formed are all the same, the only difference is the media used when carrying out the practicum.

After the practicum is carried out, the next step is to carry out the final assessment or post test to students both offline and online, and the post test results are obtained as follows To determine the effectiveness of the learning that has been carried out by looking for N-Gain from the results of the pre-test and post-test of students, the following data is obtained.

Table 4. N-Gain and N-Gain (%) of off-network learners

No.	Student Initials	Pre Test	Post Test	Post-Pre	Ideal Score	N-Gain	N-Gain (%)
1.	TB	40	50	10	60	0.167	16.667
2.	TJ	40	40	0	60	0.000	0.000
3.	AL	30	40	10	70	0.143	14.286
4.	RA	10	30	20	90	0.222	22.222

5.	SPS	30	40	10	70	0.143	14.286
6.	TA	60	40	-20	40	-0.500	-50.000
7.	VOB	10	40	30	90	0.333	33.333
8.	TS	30	10	-20	70	-0.286	-28.571
9.	M	50	30	-20	50	-0.400	-40.000
10.	PAA	60	60	0	40	0.000	0.000
11.	AAS	40	40	0	60	0.000	0.000
12.	NY	30	40	10	70	0.143	14.286
13.	NA	30	30	0	70	0.000	0.000
14.	ON	50	40	-10	50	-0.200	-20.000
15.	MAH	20	40	20	80	0.250	25.000
AVERAGE						0.001	0.101

Table 5. N-Gain and N-Gain (%) of learners in the network

No.	Student Intitials	Pre Test	Post Test	Post-Pre	Ideal Score	N-Gain	N-Gain (%)
1.	MYK	50	50	0	50	0.000	0,000
2.	AZ	10	20	10	90	0.111	11.111
3.	AM	30	30	0	70	0.000	0.000
4.	AV	30	40	10	70	0.143	14.286
5.	MSS	10	50	40	90	0.444	44.444
6.	DVPP	10	40	30	90	0.333	33.333
7.	RM	30	30	0	70	0.000	0.000
8.	DI	40	40	0	60	0.000	0.000
9.	SA	50	20	-30	50	-0.600	-60.000
10.	MAR	20	20	0	80	0.000	0.000
11.	MRSG	50	50	0	50	0.000	0.000
AVERAGE						0.039	3.925

Based on the data above, the N-Gain of students who implement learning with off-network mode is smaller than the N-Gain of participants who implement learning with on-network mode, although both are in the low and ineffective category. Students with offline learning modes carry out practicum using tools in the physics laboratory and students have never carried out practicum directly using physics laboratory equipment, based on the results of practicum carried out outside the network, students are still confused in carrying out practicum even though the tutor has been tutored by the teaching teacher. In contrast to students who carry out practicum with learning modes in the network using phet cholorado even though students have never used phet cholorado before, the media is much more practical and easy for students to follow, because of this, students with learning modes in the network better understand the material taught.

▪ CONCLUSION

Based on the results of the Pre-Test and Post test that has been given to Nine II class students, the N-Gain obtained in each learning mode both offline is 0.0010 (0.1%) and Online is 0.0392 (3.92%). Judging from the N-Gain value category and the N-Gain Effectiveness Interpretation Category, both learning modes are in the low and ineffective category. However, when viewed from the N-Gain value in each mode, Online learning

using Phet Colorado media has a greater N-Gain value so it can be concluded that the online learning mode using Phet Colorado is more effective than the offline learning mode using equipment in the Physics Laboratory.

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