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THE EFFECT OF PROBLEM BASED FLIPPED LEARNING ON HISTORICAL CONSCIOUSNESS AND CRITICAL THINKING SKILL OF STUDENTS AT SMK NEGERI 1 DENPASAR

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Abstract

The background of this research is the low levels of historical consciousness and critical thinking skills among students, caused by the dominance of conventional learning which tends to focus on factual memorization. This condition results in students' difficulty in connecting past events with present-day reality. This study aims to examine the effect of the Problem-Based Flipped Learning (PBFL) model on the historical consciousness and critical thinking skills of students at SMK Negeri 1 Denpasar. The method employed was a quasi-experiment with a pretest-posttest nonequivalent control group design . The research population consisted of 9 classes totaling 352 eleventh-grade students, with three classes selected through group random sampling to serve as the experimental group (PBFL), control group I (Problem-Based Learning), and control group II (Direct Instruction). Data were collected using historical consciousness questionnaires and critical thinking skills tests, then analyzed using multivariate analysis of covariance (MANCOVA) with pre-test scores as the covariates. The results indicated significant differences in both historical consciousness and critical thinking skills, simultaneously and individually, between students taught with the PBFL model compared to those taught with PBL and Direct Instruction models. Further analysis confirmed that the average scores of the PBFL group consistently outperformed the other groups. This research concludes that the implementation of the PBFL model effectively enhances students' historical consciousness and critical thinking sharpness through learning time efficiency and contextual problem-solving.

Keywords: critical thinking, historical consciousness, learning management system, problem-based flipped learning

1. INTRODUCTION

History education plays a crucial role in shaping a nation's national identity and collective consciousness. It is crucial for a nation to delve deeper into its own history as a continuous self-reflection through historical awareness. Historical awareness is a disposition to interact with the past through three integrated capabilities: sensitivity to history, critical understanding of historical material, and self-representation in a narrative of time, enabling individuals to create meaning from past human experiences for practical life orientation, while simultaneously building historical relevance for present-day identity and action [1]. History learning that emphasizes historical awareness enables students to not only memorize historical facts, but also evaluate, analyze, and reflect on the impact of these events on present and future life [2].

Various efforts have been made to increase historical awareness. Local history is effective in shaping the awareness of students and the community, because history in the surrounding environment will foster a sense of pride and love for past culture in an area [3]. The importance of direct student involvement in local history through visits to local historical sites, showing images or videos with local history themes taken from social media or YouTube in learning and trying to find local history reference sources outside of teaching hours [4]. However, the reality in the field shows that history learning is often trapped in a conventional pattern that emphasizes one-way information transmission and memorization of chronological facts alone [5]. This pattern results in low historical awareness among students, where past events are considered static entities separate from the dynamics of modern life. Barsch's research, (2025) also revealed that only 32% of students were able to connect historical events with

future challenges, indicating weak historical consciousness [6]. According to Yusran & Riang Tati, (2024), the challenge in increasing historical awareness that can affect the effectiveness of learning is that a dense curriculum is often one of the main obstacles due to the pressure to cover various subjects and established educational standards, teachers often feel limited in the time available to study historical material in sufficient depth so that conventional teaching is still the right choice [7].

Critical thinking is at the heart of 21st-century educational transformation, serving not only as a foundation for evidence-based decision-making and innovative solutions, but also as a key catalyst in preparing students to face the increasingly complex and digitalized dynamics of the job market [8]. Research by Yoga Pratama et al., (2024) has proven that the use of YouTube as a learning medium integrated with local history can improve students' critical thinking skills, as reflected in improved analysis quality, material understanding, and active participation in discussions and tests [9]. Critical thinking skills, an essential competency in the 21st century, have not been optimally honed due to the limited space for students to analyze, synthesize, and evaluate historical narratives [10]. The results of the National Assessment (AN) at SMK Negeri 1 Denpasar also show fluctuating developments in students' critical reasoning skills between 2022 and 2025. This indicates that despite efforts to improve, critical reasoning achievement is not yet stable and still requires more systematic intervention.

The development of digital technology in education, particularly through the use of Learning Management Systems (LMS) such as Moodle, offers opportunities to transform learning paradigms. One relevant innovation is the integration of independent and collaborative learning strategies through the Problem Based Flipped Learning (PBFL) model. This model shifts low-level cognitive activities outside the classroom through digital materials, so that classroom time can be optimized for higher-level cognitive activities through contextual problem solving [11], [12]. The implementation of PBFL is expected to bridge the gap between historical theory and social reality, so that students not only understand "when" an event occurred, but also "why" and "how" its impact on the present.

This research was conducted at SMK Negeri 1 Denpasar to fill a methodological gap in history teaching in vocational schools, which often prioritize technical competencies over historical values. Through a quasi-experimental approach, this study aims to analyze the effectiveness of the PBFL model in increasing students' historical awareness and critical thinking skills. The main focus of the research is directed at the extent to which the integration of authentic problems in the flipped classroom structure can provide a significant impact compared to standard problem-based learning (PBL) models or direct instruction [13], [14]. The problem formulation in this research is as follows:

a. Is there a difference between Problem Based Flipped Learning and Problem Based Learning and Direct Instruction in terms of historical awareness and critical thinking skills of students together?
b. Is there a difference between Problem Based Flipped Learning and Problem Based Learning and Direct Instruction in terms of students' historical awareness together?
c. Is there a difference between Problem Based Flipped Learning and Problem Based Learning and Direct Instruction in terms of students' critical thinking skills together?

2. RESEARCH METHODS

This study used a quantitative approach with a quasi-experimental method. The research design used was a Pretest-Posttest Nonequivalent Control Group Design to measure the impact of the learning model on two dependent variables simultaneously.

Population and Sample

The research population included 352 students of grade XI of SMK Negeri 1 Denpasar spread across 9 classes. Sampling was conducted using group random sampling technique , so that three classes were selected as research subjects, namely the experimental class using the Problem Based Flipped Learning (PBFL) model , the control class I using the Problem Based Learning (PBL) model, and the control class II using the Direct Instruction (DI) model .

Research Variables

This study involved one independent variable and two dependent variables, with initial historical awareness and initial critical thinking skills as covariates. The independent variables tested in this study were learning models with three dimensions: Problem-Based Flipped Learning (PBFL), Problem-Based Learning (PBL) , and Direct Instruction (DI). The dependent variables used as objects in this study were students' historical awareness and

critical thinking skills. Pre-tests of historical awareness and critical thinking were administered to the three sample groups before treatment. The relationship between the above research variables can be seen in the following chart.

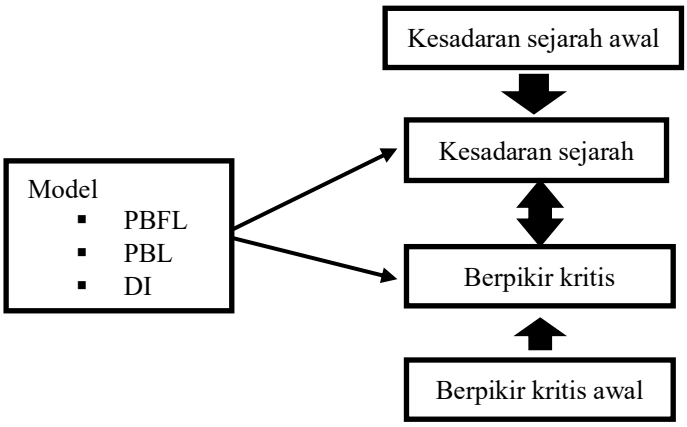

Figure 1. Constellation Between Variables

Data Collection Techniques

The data required for this study were collected using descriptive tests to measure critical thinking and questionnaires to measure historical awareness. Historical awareness indicators include knowledge of historical events, understanding of historical research methods, meaning of historical events, and usefulness of history. Critical thinking indicators include interpretation, analysis, evaluation, inference, explanation, and self-regulation. The questionnaire used a Likert scale of 1–4 (Strongly Disagree to Strongly Agree), while the critical thinking test was assessed using a rubric that included aspects of argument depth, historical accuracy, and logical reasoning. Before use, the instrument was validated by expert judgment to evaluate the suitability of the indicators, language clarity, and item relevance. The instrument was then piloted on a limited sample outside the research subjects to measure reliability using the Cronbach's Alpha coefficient (questionnaire) and inter-rater reliability (essay test). The pilot test results were analyzed and invalid items (item-total correlation value <0.3 or ambiguous) were removed.

The instrument trials conducted in this study included content validity, item internal consistency, reliability, discrimination index, and item difficulty index. Content validity is the extent to which the questions on the instrument are able to represent the expected content domain. An instrument is said to be valid if it can represent the related learning. The content validity coefficient of the historical awareness questionnaire and the critical thinking ability essay test was 1, which is in the very high criteria. In the internal consistency test, there were 9 inconsistent historical awareness questionnaire items and were therefore not used. Meanwhile, the critical thinking instrument was all consistent and all items were used. In the item difficulty index test, the calculation of the difficulty of each test item using the Merhens & Lehman formula was carried out with the help of the SPSS program. The results of the item difficulty index test for both variables are presented in the diagram below.

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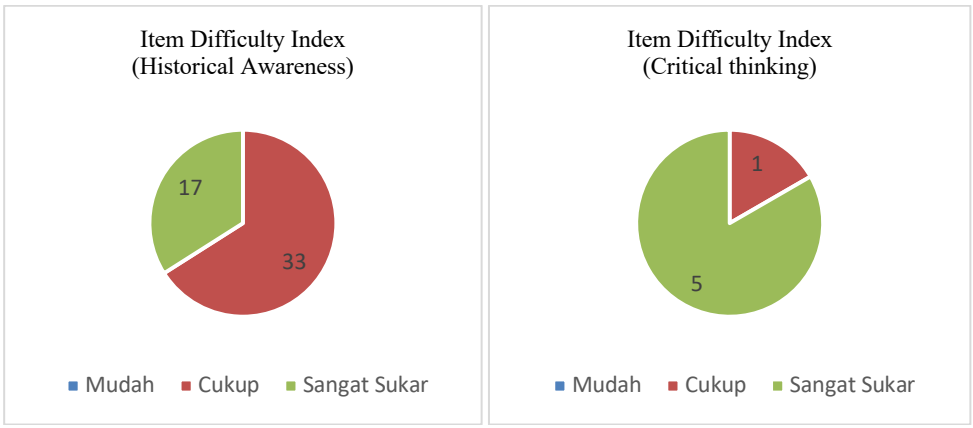
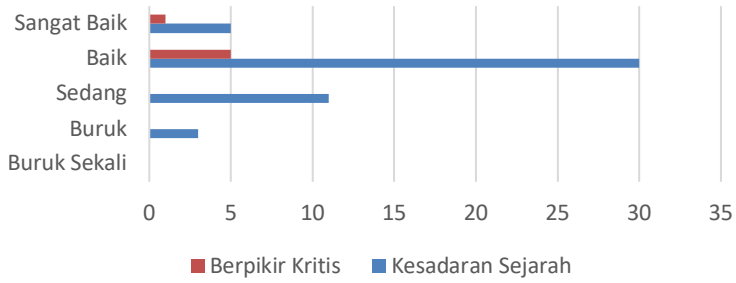
Figure 2. Item Difficulty Index Test Results



A good test item should be able to distinguish between capable and incapable test takers (Candiasa, 2011). To determine this, a Discriminatory Power Index (DIB) test was conducted. The results of the IDB test for 50 historical awareness questionnaires and 6 critical thinking essay test items are presented in the chart below.

Figure 3. Results of the Difference Index Test



The final instrument test, namely the instrument reliability test, refers to the consistency of the measurement results shown by the instrument [15]. To determine the reliability of the test, the alpha coefficient formula (Cronbach's Alpha) is used. Based on the results of the calculation of the reliability of the historical awareness questionnaire and the critical thinking essay test, a reliability coefficient of 0.949 was obtained for the historical awareness questionnaire and 0.825 for the critical thinking test. Based on the table of degrees of freedom, these coefficients have a very high degree of reliability so they meet the requirements for use in research.

Data Analysis Techniques

The data from this study were analyzed in stages according to each variable to answer the research problem. In sequence, the data analysis carried out was (1) data description, (2) analysis prerequisite test, and (3) hypothesis test . Descriptive analysis was used to describe the average score and standard deviation of critical thinking skills and student learning achievement. The mean is the arithmetic average of all scores obtained by individuals in the sample [16].

Before conducting a hypothesis test to determine whether the historical awareness and critical thinking skills of students who participated in learning with the PBFL learning model were better than those who participated in PBL and DI learning, an assumption test was conducted in conducting the MANCOVA test, namely data normality testing, homogeneity of variance, homogeneity of variance matrix test, linearity test and collinearity test. All prerequisite tests were carried out at a significance level of 5%. The normality test is a prerequisite that must be met. The purpose of the normality test is to determine whether the data for each group is normally distributed or not. The data normality test was carried out using the Shapiro-Wilk technique at a significance level (α) of 5%. The homogeneity of variance test used in this study was the Levene test. The homogeneity of

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variance/covariance matrix test conducted in this study used the Box's M test. The homogeneity of variance matrix test was used to determine whether the variance/covariance matrix of the dependent variable was the same. The linearity and significance test of the regression direction aims to ensure that the regression equation is linear and significant. Regression linearity testing is performed by testing the null hypothesis H_0that the regression model is linear against the alternative hypothesis H_1 that the regression model is nonlinear. Rejection or acceptance of the hypothesis is performed by considering the F-value for deviation from linearity and the significance value.

3. RESULTS AND DISCUSSION

3.1. Research Results

Description of Research Data

The description of the research data shows an increase in the average score (mean) in all groups of research subjects, but with significantly different magnitudes. In the historical awareness variable, the experimental group (PBFL) showed an increase from 138.79 to 144.72, surpassing the control group 1 (127.11) and control group 2 (132.54). A similar trend was found in the critical thinking ability variable, where the experimental group recorded the highest post-test score of 18.37 with a standard deviation of 2.036, while the control group 1 and control group 2 only achieved 16.42 and 14.85, respectively. The lower range and standard deviation values obtained in the post-test scores of the experimental group indicate that the application of the Problem Based Flipped Learning model is not only effective in increasing the achievement of the average score classically, but is also able to produce a more even distribution of material mastery among students compared to the Problem Based Learning model or Direct Instruction .

Assumption Testing

The data analysis used to test the hypotheses in this study was Multivariate Analysis of Covariance (MANCOVA). Before conducting the hypothesis test using the MANCOVA test, assumption tests were first conducted, including the normality test for data distribution, the homogeneity test for variance, the homogeneity test for variance/covariance matrix, the linearity test for regression and the significance test for regression direction, the collinearity test, and the hypothesis test. In this study, to test the normality of data distribution, the Shapiro-Wilk test was used.

Table 1. Results of the Normality Test of Historical Awareness and Critical Thinking Skills

Group		Sig
Historical Awareness Score	Experiment Pre-test	0.369
	Post-test Experiment	0.131
	Pre-test Control I	0.128
	Post-test Control I	0.095
	Pre-test Control II	0.811
	Post-test Control II	0.806
Critical Thinking Skills Score	Experiment Pre-test	0.069
	Post-test Experiment	0.299
	Pre-test Control I	0.074
	Post-test Control I	0.141
	Pre-test Control II	0.203
	Post-test Control II	0.128

Based on the results of the Shapiro Wilk test, all cells have a significance value of more than 0.05. Therefore, H_0 is accepted, meaning that the data on historical awareness and critical thinking skills of students, both pre-test and post-test, are normally distributed. An analysis of variance between groups was conducted to ensure that the differences in the hypothesis test were due to differences between groups, not differences within the groups. The results of the homogeneity of variance test for the learning model group showed statistical significance figures of Levene's Test of Equality of Error Variance greater than 0.05. This means that the variance between learning models in all units of analysis is homogeneous.

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Table 2. Results of the Homogeneity Test of Variants of Historical Awareness and Critical Thinking Ability

Dependent Variable	Sig.
Historical Awareness	0.058
Critical Thinking Skills	0.067

To test the homogeneity of variance together, namely the historical awareness and critical thinking ability data groups in history subjects, a homogeneity test of the variance covariance matrices was carried out using the Boxs'M value or Box's test of equality covariance matrices. The results obtained were significant, exceeding the specified significance level, meaning that the variance-covariance matrix between the variables of historical awareness and critical thinking ability was homogeneous. Therefore, the MANCOVA test could be continued.

Table 3. Results of the Matrix Homogeneity Test Covariance Variance with Box's M

Box's M	**6,270**
F	1,019
df1	6
df2	2.886E5
Sig.	0.411

The linearity of the regression tested was the linearity of the covariate of initial historical awareness on students' historical awareness after treatment and initial critical thinking ability on students' critical thinking ability after treatment. The significance value of all data at deviation from linearity > 0.05, meaning the direction of the regression from the covariate to the dependent variable is linear. Therefore, an increase in the value of the covariate will be followed by an increase in the value of the dependent variable and vice versa.

Table 4. Results of Linearity and Regression Direction Tests

		Sig.
Post-test of Historical Awareness * Pre-test of Historical Awareness of Experimental Class	Linearity	0.00
	Deviation from Linearity	0.142
Post-test of Historical Awareness * Pre-test of Historical Awareness of Control Class I	Linearity	0,000
	Deviation from Linearity	0.051
Post-test of Historical Awareness * Pre-test of Historical Awareness of Control Class II	Linearity	0,000
	Deviation from Linearity	0.110
Critical Thinking Post-test * Critical Thinking Pre-test Experimental class	Linearity	0,000
	Deviation from Linearity	0.906
Critical Thinking Post-test * Critical Thinking Pre-test Control Class I	Linearity	0.00
	Deviation from Linearity	0.846
Critical Thinking Post-test * Critical Thinking Pre-test Control Class II	Linearity	0.00
	Deviation from Linearity	0.597

The homogeneity test of the regression slope was carried out to ensure that there was no interaction between the independent variable (learning model) and the covariate variable (pre-test). The results of the regression slope homogeneity assumption test showed no interaction between the learning model and students' initial abilities, with a significance value of 0.716 for historical awareness and 0.892 for critical thinking. Because both values are greater than $\alpha = 0.05$, the assumption is met so that data analysis can be continued using Multivariate Analysis of Covariance (MANCOVA).

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Table 7. Results of the Homogeneity Test of Regression Slope

Multivariate Tests [c]						
Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.324	25,867 [a]	2,000	108,000	.000
	Wilks' Lambda	.676	25,867 [a]	2,000	108,000	.000
	Hotelling's Trace	.479	25,867 [a]	2,000	108,000	.000
	Roy's Largest Root	.479	25,867 [a]	2,000	108,000	.000
X	Pillai's Trace	.019	.530	4,000	218,000	.714
	Wilks' Lambda	.981	.528 [a]	4,000	216,000	.716
	Hotelling's Trace	.020	.525	4,000	214,000	.718
	Roy's Largest Root	.019	1,030 [b]	2,000	109,000	.360
Cov1	Pillai's Trace	.543	64,058 [a]	2,000	108,000	.000
	Wilks' Lambda	.457	64,058 [a]	2,000	108,000	.000
	Hotelling's Trace	1,186	64,058 [a]	2,000	108,000	.000
	Roy's Largest Root	1,186	64,058 [a]	2,000	108,000	.000
Cov2	Pillai's Trace	.670	1.096E2 [a]	2,000	108,000	.000
	Wilks' Lambda	.330	1.096E2 [a]	2,000	108,000	.000
	Hotelling's Trace	2,029	1.096E2 [a]	2,000	108,000	.000
	Roy's Largest Root	2,029	1.096E2 [a]	2,000	108,000	.000
X * Cov1	Pillai's Trace	.019	.527	4,000	218,000	.716
	Wilks' Lambda	.981	.525 [a]	4,000	216,000	.717
	Hotelling's Trace	.020	.523	4,000	214,000	.719
	Roy's Largest Root	.019	1.052 [b]	2,000	109,000	.353
X * Cov2	Pillai's Trace	.010	.279	4,000	218,000	.892
	Wilks' Lambda	.990	.276 [a]	4,000	216,000	.893
	Hotelling's Trace	.010	.274	4,000	214,000	.895
	Roy's Largest Root	.007	.402 [b]	2,000	109,000	.670

The collinearity test was conducted to determine whether there is a significant relationship between historical awareness and critical thinking. If there is no significant relationship, it means that there are no similar aspects measured in the variable, thus the MANCOVA test can be continued. From the analysis results, the correlation coefficient value between historical awareness and critical thinking is 0.129 with a significant value of 0.164, this value is greater than the 5% significance level, this means that H0 $_{is}$ accepted, so it can be concluded that there is no significant correlation between historical awareness and critical thinking.

Table 8. Collinearity Test Results

Correlations	
r count	sig
0.129	0.164
0.938	1,066

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The collinearity test in this study aims to determine a strong (significant) relationship between the dependent variables. If a strong correlation exists, it indicates that the same aspect is being measured in that variable. The results show that the tolerance value is >0.10 and the VIF value is <10, indicating no collinearity in the regression model. These results indicate that the MANCOVA test can proceed.

Table 9. Multicollinearity Test Results

Model	Collinearity Statistics	
	Tolerance	VIF
1. Historical Awareness	0.938	1,066
2. Critical Thinking Skills	0.938	1,066

Research Hypothesis Testing

Hypothesis I states that there is a difference in historical awareness and critical thinking together between students who learn using the PBFL model and students who take part in learning using the PBL and DI models after controlling for the pre-test. The significance level in Table 10 is less than 0.05. Based on these results, H0 $_{is}$ rejected and H1 $_{is}$ accepted. This means that the learning model simultaneously (as a whole) influences students' historical awareness and critical thinking skills after controlling for the pre-test.

Table 10. Multivariate Test Results

Effect		Sig
Learning model	Pillais's Trace	0.00
	Wilks' Lambda	0.00
	Hotelling's Trace	0.00
	Roy's Largest Root	0.00

Table 11. Between-Subjects Effect Od Test

Source	Dependent Variable	Sig
Historical Awareness Pre-test	Post-test Historical Awareness	0.00
	Post-test Critical thinking	0.02
Critical Thinking Skills Pre-test	Post-test Historical Awareness	0.026
	Critical Thinking Post-test	0.00
Learning model	Post-test Historical Awareness	0.00
	Post-test Critical thinking	0.00

Hypothesis II, states that there is a difference in historical awareness between students who learn with the PBFL model and students who follow learning using the PBL model and the DI model after controlling for the pre-test. The significance value for historical awareness is presented in Table 11. Based on Table 11, it is shown that the significance value for historical awareness = 0.00 < 0.05, so H0 $_{is}$ rejected. So there is a significant difference in critical thinking skills between students who are taught with the PBFL learning model and students who are taught with the PBL and DI models. Hypothesis III states that there is a difference in critical thinking skills between students who learn with the PBFL model and students who follow learning using the PBL model and the DI model after controlling for the pre-test. From Table 11, it is shown that the significance value for critical thinking skills = 0.00 > 0.05, so H_0 is rejected. So there is a significant difference in critical thinking skills between students who are taught with the PBFL learning model and students who are taught with the PBL and DI models.

3.2. Discussion

Testing through Multivariate Analysis of Covariance (MANCOVA) confirms that the Problem Based Flipped Learning (PBFL) model assisted by the Learning Management System (LMS) provides a significantly higher influence on students' historical awareness and critical thinking skills simultaneously compared to the PBL and

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Direct Instruction models . The advantage of the PBFL model lies in the integration of the DEEP flow (Detection-Exploration-Expression-Practice) in the pre-class phase , which equips students with initial conceptual understanding and cognitive readiness before entering the classroom. This allows for efficient learning time during the in-class phase , so that learning activities can be fully focused on authentic problem investigations and in-depth discussions that stimulate analytical sharpness without being hampered by the limitations of face-to-face duration as often occurs in conventional PBL models.

Comparatively, mastering concepts outside of school hours through the flipped phase provides a foundation for students to actively engage as learning subjects, where the teacher transforms into a guide on the side . The LMS features are equipped with interactive media ranging from gamification of various types of games, interactive discussions between groups and across groups, interactive books, interactive videos, reflection activities, and practice questions. These features also have a significant influence on the development of historical awareness and critical thinking skills of students. Observations show that students in PBFL classes have higher confidence in arguing and dissecting historical events objectively, which ultimately strengthens their historical awareness. In contrast, the teacher-centered Direct Instruction model limits the space for argumentation, while PBL without a flipped strategy tends to experience a reduction in the value reflection phase due to the density of material. These findings confirm that the synergy between problem-based learning and digital technology in a flipped classroom format is an effective strategy for stimulating higher-order thinking skills and historical values in the digital era.

the Problem Based Flipped Learning (PBFL) model is significantly more effective in increasing students' historical awareness compared to the PBL and Direct Instruction models due to the transformation of cognitive structures through the shift in learning phases. By moving Lower Order Thinking Skills (LOTS) activities outside the classroom through interactive digital media, students have the freedom to build historical empathy and independent reflection before face-to-face sessions begin. The integration of authentic problems in this flipped classroom scheme creates a space for autonomous learning that changes students' perception of history from merely a static narrative to a dynamic dialectic, thus triggering a deeper and more persistent internalization of past values in projecting their role in the future.

Problem Based Flipped Learning (PBFL) model has also proven significantly superior in improving students' critical thinking skills compared to PBL and Direct Instruction models through strategic cognitive time management. By moving the independent literacy phase and concept exploration outside of school hours, face-to-face sessions are transformed into dynamic dialectical arenas that focus students' cognitive capacity on Higher Order Thinking Skills (HOTS) activities such as analysis, evaluation, and inference. The use of ill-structured problems in the flipped phase triggers in-depth heuristic and source criticism skills, enabling students to detect information bias and draw logical conclusions based on historical evidence. This success confirms that the synergy between the flipped classroom strategy and problem-based learning not only improves academic scores but also builds a culture of adaptive analytical thinking as a transferable skill for vocational high school students.

The findings of this study provide pedagogical implications that the selection of innovative and adaptive learning models, particularly through the integration of Problem-Based Learning and flipped classroom strategies , has been empirically proven to be able to transform history learning from mere cognitive transfer to a process of internalizing profound historical values. The use of digital media through a Learning Management System (LMS) before face-to-face meetings has implications for the creation of cognitive time efficiency, so that teachers can shift the focus of classroom interactions towards higher-order thinking skills such as source criticism and event analysis. Furthermore, the effectiveness of the Problem Based Flipped Learning (PBFL) model emphasizes the importance of educational institutions' support in developing sustainable learning tools that are able to balance the demands of 21st-century competencies with strengthening national identity through a strong historical awareness in students.

4. CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the implementation of the Problem Based Flipped Learning (PBFL) model has a positive and significant effect on historical awareness and critical thinking skills of students at SMK Negeri 1 Denpasar, both simultaneously and partially, compared to the Problem Based Learning (PBL) and Direct Instruction (DI) models. The superiority of the PBFL model is proven by the achievement of average scores in the experimental class which consistently exceed those of the comparison class, where the integration of the flipped classroom strategy is able to create cognitive time efficiency that provides wider reflection space for students to internalize historical values in the pre-class phase . In addition, the use of unstructured problems during face-to-face sessions has been proven to be effective in activating sharper analytical,

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evaluation, and inference skills, so that the synergy between digital-based learning independence and contextual problem solving is a superior pedagogical solution in improving learning outcomes in the affective and cognitive aspects of students.

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