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The Effect of Problem-Based Learning Integrated Local Wisdom on Student Hots and Scientific Attitude

Hikmawati[1*], I Wayan Suastra[2], Ketut Suma[2], A.A. Istri Agung Rai Sudiatmika[2], Rohani[3]

[1] Department of Physics Education, University of Mataram, Mataram, Indonesia
[2] Science education study program, Universitas Pendidikan Ganesha, Singaraja, Indonesia
[3] SMP Negeri 16 Mataram, Mataram, Indonesia

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Abstract: The purpose of the study was to analyze the effect of Problem-Based Learning (PBL) integrated with local wisdom on Higher-Order Thinking Skills (HOTS) and students' scientific attitudes. Local wisdom used is a tourist objects on the island of Lombok. The topic of learning is the interaction of living things on Senggigi Beach, Sesaot Forest, and Mount Rinjani. The research method used is quantitative with a posttest only control group design. The population of this study includes 6 classes with 172 7th grade students at SMP Negeri 16 Mataram. Samples were taken using cluster random sampling technique, class 7C became the experimental class (32 students), while class 7F became the control class (21 students). The HOTS test instrument is in the form of an essay while the student's scientific attitude instrument is in the form of an observation sheet. Statistical analysis used one-way MANOVA and analyzed using SPSS 25 application. Hypothesis test results showed differences in HOTS and students' scientific attitudes with PBL models and conventional learning. The mean of HOTS and scientific attitude in the experimental class is superior to the control class. The test of between-subjects effects for the HOTS variable and scientific attitude shows differences in HOTS and scientific attitudes due to differences in learning models. Therefore, the PBL model integrated with local wisdom has an effect on HOTS and students' scientific attitudes.

Keywords: science; tourist objects; HOTS; attitude.

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Introduction

Mastery of Indonesian students' science concepts is still relatively low. The science average score of Indonesian students in PISA 2018 is 396, still far from the world average (OECD, 2019), and the Index of Human Development in Indonesia is ranked 107th (UNDP, 2020). Efforts are being made by the government to increase the quality of education, including in the field of science, including by changing the curriculum. Science learning should be integrated into culture and ethnoscience-based learning in most classroom activities, so that there is a balance between globalization and glocalization (Suprapto, et al., 2021). The same thing is environmental-based education which aims to make students participate in protecting the environment and making the environment not only to be exploited but also an asset that must be maintained and protected (Mithen, et al., 2021). These assets include tourist objects such as beaches, forests, and mountains. Tourist objects found on Lombok Island include Senggigi Beach, Sesaot Forest, and Mount Rinjani.

*Email: hikmawati@unram.ac.id

Natural science learning based on local culture or traditions affects student learning outcomes and social attitudes (Widiana, et al., 2021). Local traditions of the Sasak tribe on the island of Lombok include the Pilgrimage to the Grave which ends with a casual gathering with family at tourist objects such as Senggigi Beach, Sesaot Forest, or to Sembalun, the area around Mount Rinjani. Students can observe the interaction between living things and the environment in the tourist objects. Students can also see directly the biotic and abiotic components, and then connect them with the concept of ecosystems. Teachers can write enrichment books about local wisdom to help students improve their mastery of science concepts (Dewi, et al., 2020).

Science learning by applying real problem solving strategies that are close to the student's environment will create meaningful learning (López-Jiménez, et al., 2021). The real problem in question is, for example, environmental damage. Environmental damage has an impact on the interactions of living things that occur in an area, such as the Senggigi beach, Sesaot forest, and Mount Rinjani. Thus, students' ecocritical thinking skills are very important to develop (Purnami, et al., 2021). This can be done through the preparation of a curriculum for environmental materials associated with ecocritical thinking skills. Curriculum design in tertiary institutions must also be designed in such a way that prospective science education teachers have good pedagogic and professional abilities both during internships and as teachers (Rusydiyah, et al., 2021).

Science learning based on tourist objects improves learning outcomes and cares about the environment. Environmental education patterns that integrate classroom activities and real experiences outside the classroom need to be developed to strengthen the formation of attitudes and behaviours that care about the environment (Sholahuddin, et al., 2021). Science learning that integrates local wisdom can be an effort to develop a caring attitude for students' local culture in accordance with educational goals (Hikmawati, et al., 2020). Local culture-based learning also has a positive effect on the level of critical thinking and the level of communication that students have (Hikmawati, et al., 2021).

Local wisdom can be integrated in the PBL model. This model affects learning outcomes (Sunariyati, et al., 2014); (Mayub, et al., 2020), concept understanding (Uliyandari, et al., 2021), scientific literacy (Parno, et al., 2020), environmental literacy (Suryawati, et al., 2020), problem solving skill (Wijaya et al., 2018); (Purwaningsih, et al., 2020), critical thinking skills (Alvionita, et al., 2020) and scientific attitude of students (Astika, et al., 2013). The discovery-based model that is integrated with local wisdom can improve critical thinking skills, when viewed from a gender perspective, it is found that male students are more critical than female students (Ramdani, et al., 2021).

Studies on the PBL model have been carried out by many researchers, but those that integrate local wisdom in the form of tourist objects such as beaches, forests, and mountains are still rarely done. Research that examines the influence of PBL on HOTS which consists of analysis, evaluate, and create is also still rarely done. This study aims to analyse the influence of the local wisdom integrated PBL model on HOTS and students' scientific attitudes.

Method

This research method is quantitative using a post-test only control group design, there are two groups selected randomly. The research population includes 6 classes with a total of 172 7th grade students at SMP Negeri 16 Mataram. Samples were taken by cluster random sampling, class 7C became the experimental class (32 students) and class 7F became the control class (21 students).

Students in the experimental class were given an action, namely the integrated PBL model of local wisdom. Students in the control class were not given this action (conventional learning model in the form of discussion). Local wisdom used in this study is tourist objects on the island of Lombok, namely: Senggigi Beach, Sesaot Forest, and Mount Rinjani.

In the Syllabus of Science Subjects, it is stated that the basic material on Ecosystems is taught in class VII (Junior High School). Basic competence (knowledge) is the analysis of the interaction between living things and their environment. Basic competence (skills) is an activity for presenting the results of student observations of the interactions of living things in the environment around students (Kemendikbud, 2017).

The HOTS test instrument is in the form of an essay that measures the ability to analyse, evaluate, and create (Agussuryani, et al., 2020). The scientific attitude instrument is an observation sheet consisting of four indicators, namely communication skills, curiosity, responsibility and thoroughness (Israfiddin, et al., 2021).

Science learning with a problem-based learning model is integrated with local wisdom in this research carried out online due to COVID-19. The platforms used are WhatsApp and Google Meet. Statistical analysis using one-way MANOVA and analysed with the help of SPSS 25 application. The data analysis step

is to describe the results of: Box's M test, hypothesis test results (Multivariate tests), descriptive test results, results from the homogeneity of variance test (Levene's tests), and the last result of the test of between-subjects effects.

Result and Discussion

Results

The results of statistical analysis using one-way MANOVA produce the following data. Box's M test results are shown in Table 1.

Table 1. Box's M test

Box's Test of Equality of Covariance Matrices[a]	
Box's M	3.863
F	1.229
df1	3
df2	88103.830
Sig.	0.297

a. Design: Intercept + Class

The price of Box's M is 3.863 and the price of F is 1.229 with a significance of 0.297 greater than the alpha price of 0.05, then the MANOVA analysis is continued. The results of hypothesis testing with Multivariate tests are shown in Table 2.

Table 2. Multivariate tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	0.995	5153.297[b]	2.000	50.000	0.000
	Wilks' Lambda	0.005	5153.297[b]	2.000	50.000	0.000
	Hotelling's Trace	206.132	5153.297[b]	2.000	50.000	0.000
	Roy's Largest Root	206.132	5153.297[b]	2.000	50.000	0.000
Class	Pillai's Trace	0.171	5.158[b]	2.000	50.000	0.009
	Wilks' Lambda	0.829	5.158[b]	2.000	50.000	0.009
	Hotelling's Trace	0.206	5.158[b]	2.000	50.000	0.009
	Roy's Largest Root	0.206	5.158[b]	2.000	50.000	0.009

a. Design: Intercept + Class
b. Exact statistic

The results of the hypothesis test are that the F value is 5.158 with a significance of 0.009 which is much smaller than the alpha value of 0.05, so there are differences in HOTS and scientific attitudes between students in the PBL model and conventional learning. The descriptive test is shown in Table 3.

Table 3. Descriptive test

Class		Mean	Std. Deviation	N
HOTS	1	85.78	8.435	32
	2	78.81	7.054	21
	Total	83.02	8.568	53
Attitudes	1	80.94	5.149	32
	2	76.43	5.946	21
	Total	79.15	5.862	53

The average HOTS and scientific attitude in the experimental class were 85.78 and 80.94, respectively, while the control class was 78.81 and 76.43 respectively, so that the experimental class was superior to the control class. Levene's test is shown in Table 4.

Table 4. Levene's tests

		Levene Statistic	df1	df2	Sig.
HOTS	Based on Mean	1.973	1	51	0.166
	Based on Median	1.521	1	51	0.223
	Based on Median and with adjusted df	1.521	1	47.256	0.224
	Based on trimmed mean	2.005	1	51	0.163
Atti-tudes	Based on Mean	0.254	1	51	0.616
	Based on Median	0.003	1	51	0.959
	Based on Median and with adjusted df	0.003	1	47.397	0.959
	Based on trimmed mean	0.093	1	51	0.762

a. Design: Intercept + Class

All Levene test results showed a significance value greater than the alpha value of 0.05, so the two groups were homogeneous. The results of ANOVA per dependent variable are shown in Table 5.

Table 5. ANOVA per dependent variable

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	HOTS	616.274[a]	1	616.274	9.820	0.003
	Attitudes	257.775[b]	1	257.775	8.598	0.005
Intercept	HOTS	343482.312	1	343482.312	5473.040	0.000
	Attitudes	313989.850	1	313989.850	10473.051	0.000
Class	HOTS	616.274	1	616.274	9.820	0.003
	Attitudes	257.775	1	257.775	8.598	0.005
Error	HOTS	3200.707	51	62.759		
	Attitudes	1529.018	51	29.981		
Total	HOTS	369100.000	53			
	Attitudes	333825.000	53			
Corrected Total	HOTS	3816.981	52			
	Attitudes	1786.792	52			

a. R Squared = .161 (Adjusted R Squared = .145)
b. R Squared = .144 (Adjusted R Squared = .127)

The dependent variable HOTS produces an F value of 9.820 with a significance of 0.003 which is smaller than the alpha value of 0.05, so there are differences in HOTS due to differences in learning models. For the corrected model with the dependent variable scientific attitude produces an F value of 8.598 and a significance value of 0.005 which is smaller than an alpha value of 0.05, then there are differences in scientific attitudes due to differences in learning models. Thus, it can be concluded that there is an effect of problem-based learning model integrated with local wisdom on students' higher-order thinking skills and scientific attitudes.

Discussion

Science learning activities on the topic of the interaction of living things through an integrated PBL model of local wisdom in the form of tourist objects on the island of Lombok are as follows: First, observing artificial ecosystems in the form of videos and pictures, namely aquariums focused on biotic and abiotic components and the interactions that occur in them. Second, conduct investigations through literature studies and video and image observations to identify abiotic and biotic components in the surrounding environment (tourist objects: Senggigi Beach, Sesaot Forest, and Mount Rinjani), as well as the interactions that occur in them in the form of food chains, food webs, and symbiosis. Third, make observations through videos about the population growth found in tourist objects on the island of Lombok and the impact it has on the surrounding environment. Fourth, compile reports on observations about the interaction of biotic and abiotic components found in tourist objects on Lombok Island and discuss with other students.

The structure of the implementation of problem-based learning integrated with local wisdom is shown in Figure 1.

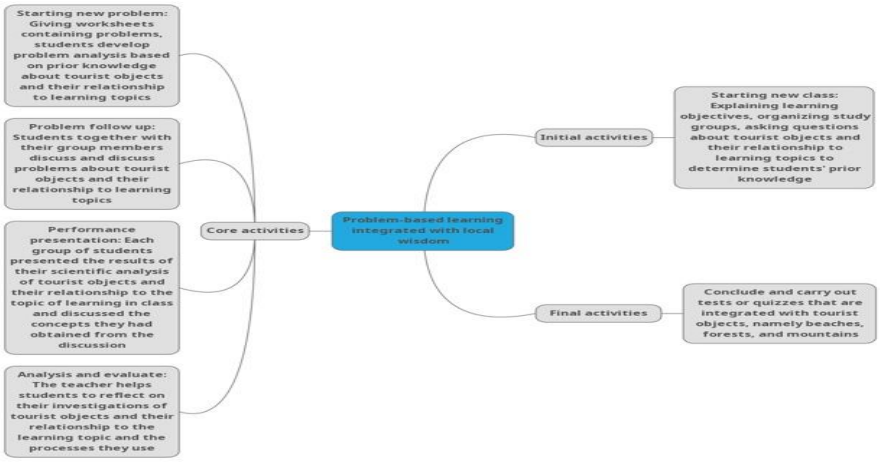

Figure 1. Implementation of problem-based learning integrated with local wisdom

Utilization of meadows around schools, homes, and in the area around tourist attractions is one way of learning that is carried out outside the classroom. The use of the grassland is as a source of learning on the

material component of the ecosystem, including the interaction of living things and their environment. Learning outside the classroom requires students to be able to reason and understand the topic so that high student concentration is required. Learning outside the classroom causes lessons to be less boring and students learn directly from the real world, not just learning theory from books. The surrounding environment, such as tourist objects (in the form of beaches, forests, and mountains), affects the learning process of a student because the environment that is deliberately used as a tool in the educational process can provide experiences to students (Sagala, et al., 2021).

Tourist objects such as beaches, forests, and mountains have various biotic components such as plants that are identified as being able to become herbal medicines. Utilization of traditional medicinal plants of the Sasak, Samawa, Mbojo (SASAMBO) tribes on the islands of Lombok and Sumbawa can be potential as traditional health tourism destinations. Thus, it can be said that local wisdom in the form of culture or tradition can not only be useful in the field of education but also in the field of tourism business (Hakim, et al., 2020).

Learning by paying attention to local culture or traditions not only increases mastery of concepts but also soft skills. Soft skills of students that can be developed through learning based on culture or local traditions are collaboration skills, critical thinking skills, nationality, socio-cultural awareness, leadership, environmental awareness, and curiosity. The diversity of Indonesian ethnicities and cultures is a challenge for teachers to design lessons that are relevant to the characteristics of students. That is, the obstacles faced by teachers are creativity in integrating concepts about culture in science learning, understanding student concepts, time constraints, and student and teacher paradigms (Rahmawati, et al., 2020). If in tourist objects-based science learning, students' misconceptions about the topic of the interaction of living things and their environment occur, the teacher can use scaffolding. Learning with the help of scaffolding has an effect on decreasing the percentage of students' misconceptions (Haidar, et al., 2020).

Local wisdom-based learning in the form of tourist objects has limitations, including restrictions on activities outside the home due to the COVID-19 pandemic so that field visits cannot be carried out. Face-to-face learning can be shifted to online learning by utilizing technology (Rizal, et al., 2020). Adaptation of new habits in various aspects of life, including education, is needed in the midst of the COVID-19 outbreak. The application of online learning as a form of social distancing policy is a sudden change in the learning system. This is a challenge for teachers. They must be able to integrate technology, pedagogy, and content knowledge to do online learning well (Juanda, et al., 2021).

Science learning that integrates local wisdom (ethnoscience, local traditions, and local culture) can improve student competence (Usmeldi & Amini, 2020), science practicum based on local wisdom affects attitudes, scientific literacy, and learning outcomes (Hadisaputra et al., 2020), local wisdom-based learning can also improve students' problem solving and communication skills (Fadli & Irwanto, 2020), and learning that integrates local wisdom can improve 21st century skills that students must have in facing global competition (Pujiastuti, et al., 2020).

Local wisdom that exists on the island of Lombok, apart from the tradition of Pilgrimage to tourist objects, can also be in the form of ethnoscience. Local wisdoms of the Sasak people that have ethno-science potential include non-standard unit sizes in Sasak Sade Village, the Bau Nyale tradition related to the story of Princess Mandalika, the manufacture of Lombok Sesek weaving, traditional musical instruments Gendang Beleq, and traditional snacks Poteng Reket. The five local wisdoms correspond to the topic of science learning, namely measurement, classification of living things, substances and mixtures, vibration and sound, and conventional biotechnology. (Hikmawati, et al., 2021).

Conclusion

The application of the problem-based learning model that is integrated with local wisdom has an effect on students' higher order thinking skills (HOTS) and students' scientific attitudes. Local wisdom that can be used on the topic of the interaction of living things is tourist objects in the form of beaches, mountains, and forests. This local wisdom is related to the local tradition of the Sasak tribe, namely the Pilgrimage to the Grave which ends with a relaxed gathering with family at Senggigi Beach, Sesaot Forest, and Sembalun, the area around Mount Rinjani.

Science learning through problem-based learning that is integrated with local wisdom in the form of tourist objects can be developed for wider material and also tourist objects other than beaches, forests, and mountains. The intended tourist objects are for example: tourist parks, tourist plantations, waterfalls, rivers, lakes, and so on.

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