Development Project Based Learning Model with Performance Assessment Based Ethnoscience to Improve Students' Critical Thinking

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Abstract: Learning is an interaction between students and educators in a learning environment. The learning process and outcomes are measured using Performance Assessment. The Performance assessment is a suitable tool in biology learning to improve critical thinking skills. this research aimed to develop a project-based learning model with an ethnoscience-based performance assessment and determine the model's practicality for increasing students' critical thinking skills, especially in ethnoscience learning. The method used was a mixed-method design (quantitative and qualitative data) with a research and development model using the 4D model approach (define, design, develop, and disseminate). The research was conducted in SMA Negeri 1 Manyak Panyed, SMA Negeri 2 Patra Nusa, SMA Negeri 1 Langsa, SMA Negeri 5 Langsa, SMA Negeri 1 Sungai Raya and SMA Unggul Aceh Timur. The instruments used were validation sheets by biology lecturers and teachers and students' questionnaires. The analysis was administrated through Aiken V coefficients for the critical thinking skills test. The results showed that the project-based learning model with an ethnoscience-based performance assessment was effective as a learning tool for students and teachers. In addition, the test of practicality regarding critical thinking skills revealed an improvement in students' knowledge of ethnoscience.

Keywords: Ethnoscience; Performance Assessment; Project-based learning model

Introduction

Science moment this has developed control culture, branch science, discoveries, and history that science can answer (Iskandar et al., 2019). Science is issued its purity so that it can be compiled by science education (Siregar et al., 2020). Ethnoscience relates tight between nation or culture and science or science (Yuliana, 2017). Learning methods and models depend on the format of new learning, like invention problems and creating products (Stanley & Brickhouse, 2001). The PjBL learning model uses an approach to teaching students to problems (constructivism) (Mihardi, 2013; Bender, 2012). PjBL model design process model technology that builds and improves content knowledge, problem-solving ability, system thinking, and communication skills (Baker et al.,

2011). Activity PjBL student-centered (Bagheri et al., 2013). Students are requested to apply knowledge in solving problems, ability to make decisions, achievements products relevant and with questions or problems (Pickens et al., 2012).

Because that's necessary, ese of performance assessment to solve the problem of evaluating students' ability to be involved in learning, so make the student more active (Surjawanto et al., 2014). Performance assessment can encourage creativity educators to develop an appraisal process in learning (Izza, 2014). But students own the Performance assessment process, not yet done in a manner maximum. this is seen from the lower test average scores nationally from the previous year (Kemendikbud, 2017). this caused some teachers to not apply appropriate and partial learning strategies and

model great teacher objectives when evaluating the performance of students in learning. because that's the student must own skills to think critically.

Skills think critical of course very important and helpful in the learning process. Thinking critically is also related to abilities where reasoning and judgment become instruments used to process information and not accept just existing information (Fahim & Pezeshki, 2012). Studies conducted to measure associated scientific literacy with Skills level show that Indonesia was ranked 60th out of 65 participating countries in 2009, 64th out of 65 countries in 2012, and 69th out of 75 in 2015 (OECD, 2010; 2014; 2016). Besides that, research by Susilawati et al., (2020) concluded that 64% of high school students have a level of Skills that think category critical low.

The PjBL model is also said to be a student-centered learning activity and fosters critical thinking, communicative, investigative, interactive, and experimental learning (Farida et al., 2017). The results above naturally confirm that Indonesian students yet trained for their own Skill level like thinking critically (Suprapto, 2016). One ability that is necessary for someone can contribute to the public is the ability to think critically (Facione, 2015) and scientific literacy. In the research of Kono et al (2016), is written that students who have methods that think critically are more skilled in solving A problem. Besides, one objective of education is for students to have Skills to think critically (Khoiriyah et al, 2014). this is natural because Skills thinking critically will enable students to analyze and construct knowledge (Robbins et al, 2011). this is supported by research conducted by Mahanal & Siti (2017) and also by research conducted by Hairida (2016) low skills think critical Indonesian students were also seen in a study conducted by the Program for International Student Assessment (PISA).

To overcome the problem the naturally needed variations of learning models. Learning models naturally must be designed such that they can improve critical thinking students' ability. The PjBL model is beneficial for solving problems Participants educate with the ability attitude think critically as well as grow knowledge environment (Birgili, 2015). this will make students own skills think critically, asserted that implementation of a learning models-based project can awaken Skills think critical students (Lapuz & Fulgencio, 2020).

Observations made at school consisting of goals from three areas namely SMA Negeri Kabupaten Aceh Tamiang, Kota Langsa, and Kabupaten Aceh Timur eye lesson biology, found that Skills think critical student Still Not yet well, looks from inclined students _ behave passively during learning going on, rarely ask, and trouble answer question-related problem life every day. After done test initial, value ability critical students were categorized as low. It is because received learning students have not yet trained or developed critical thinking skills using learning models projects. Students have a role important in arranging reason and thinking critically as well as attitude scientific to assignments given by the teacher.

Based on the description before, the objective study is developing a project-based learning model with performance-based assessment ethnoscience to increase the ability to think critically student as well as describe the quality of the PjBL model with performance-based assessment ethnoscience reviewed from aspect validity, practicality, and effectiveness.

Method

this research is research and development or Research and Purposeful Development (R&D). produce products and test the effectiveness of the product (Sugiyono, 2013). The development model used is the ADDIE model. stands for Analysis, Design, Development, Implementation, and Evaluation. Technique data collection in this study is by giving test sheets and sheets questionnaires.

Research this held with the objective for develop A product shaped project-based learning model with performance assessment-based ethnoscience. Product developed through a project-based learning model with a performance assessment instrument model, both test and non-test syntax special and needed modification to suit with research and development research, in matter this can explain stages of the research model as follows:

Define phase

Phase definition used as stage determination need customized learning with objective learning. There are five steps necessary in phase this, ie analysis problem, analysis students, analysis concept, analysis task, and analysis objective learning.

Analysis Problems

In this phase bring up something problem to participant educate in project based learning model with performance assessment in enhancement ability think critical from draft material ethnoscience that lies in potential local target location research.

Analysis Need Participant educate

In this phase development project-based learning model with performance assessment based ethnoscience for increase ability think critically high school students reviewed from teacher aspects and aspects student. In this phase participant educates given something the project-based learning model provided in the form of a performance assessment. In this phase student given

task find draft material learning related biology with ethnoscience from demands competence the basis stated in the curriculum.

Design Phase

Deat stages planning this explain the design process product to be planned in the activity process research, in matter this can exposed as following: (a) Do something determination For reach objective from development project based learning model with performance assessment based ethnoscience; (b) Develop test ability think critical to student to knowledge about ethnoscience; (c) Do something study analysis about ethnoscience in each area target samples that have set; (d) Determine achievements learning; (e) Develop grid instruments And Instrument study; (f) Designing framework model learning project based learning with performance assessment.

Phase Develope

In this phase explains from the goal is to develop an initial form of a prototype. As for activities on this stage is: (a) Developing project based learning models with ethnoscience-based performance assessments; (b) Developing channel objective learning; (c) Developing module that teach ethnoscience.

At stage this done Validity test content done through review expert which is the process of validation logical to assessment performance with learning models project-based learning in study material ethnoscience carried out by the validator namely lecturers and field teacher's studies biology. Product drafts that have been validated will obtained assessment and input for made repair before trials were carried out to field.

Results and Discussion

Stage Defining (Define)

Define stage is stage beginning for set How condition development of learning models in accordance need user. There is four stage analysis namely: (a) analysis problem; (b) analysis need participant educate; (c) analysis concept; (d) analysis task. Fourth stages analysis this can done with do observation field and study library. This FGD was also carried out as step beginning defining the learning model that will be done together team expert.

Product Design Stage (Design)

Product development form design instructional PjBL project-based learning model with performance

assessment based ethnoscience. Product developed by stages activity learning that refers to the PjBL model namely : 1) begins with question important, take appropriate topic with reality of the real world and begins with investigation students, 2) planning Work project, and selection related activities with ethnoscience in answer question important, 3) compile timetable activities, 4) monitoring development project students, 5) assessment results project students, 6) evaluation experience Study student. this step-in line with study of Muskania & Wilujeng (2017) that learning project started with give problem leading to the product the end will be produced by students. After exchange thoughts, steps furthermore student given task for create and design project. During design project, students directed for look for valid literature and sources and such journal scientific. Collaborating with the team during learning projects is very important. Collaboration is one _ characteristic activity learning project with the objective help student for exchange thoughts/ideas and have ability good communication. Furthermore Astawa, et al (2017) explained that the stages of project learning train student for become thinker active and creative as well as involved in learning cooperative For Work same. Stage design PjBL model products compiled systematically by material related ethnoscience with ethnobotany to be studied. Developed learning format is learning based possible projects seen in the picture under this:
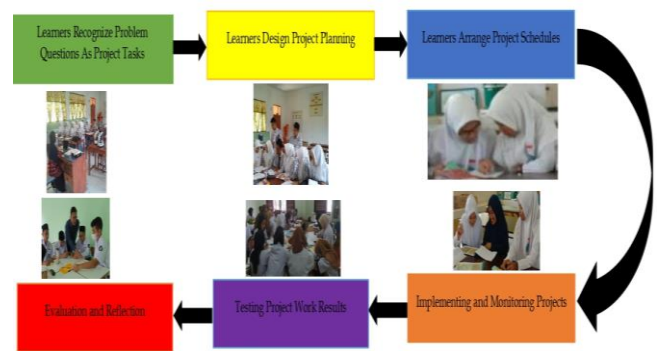

Figure 1. PjBL Model Design

Furthermore, about design developed performance assessment product totaling 20 items question in form question choice valid doubles 15 questions reasoned reasoning Skills think tested critical try it instrument test will validated by experts

Table 2. Analysis Question Skills Think Critical in Context Studying Ethnoscience About Utilization Ethnobotany as Plant Drug for Society

Context Ethnoscience Utilization Ethnobotany	Context Dra Scientific	Photos Study
Gandarusa (*Jisticia gendarussa*): Decreasing fever and loose stools _	antioxidants Like Flavonoids, Saponins, Tannins and Phenols.	
Flowers _ Peacock (*Clitoria ternatea*) : Diarrhoea	Efficacious Flavonoid Compounds and Saponins As Antibacterial	
Noni (*Morinda citrifolia*) :	Antioxidant Strong Such as Vitamin C, A, B3 (Niacin) And Substances Iro	
Candlenut (*Aleurites moluccanus*): Cough	Anti-inflammatory, Antioxidant, Antifungal, and Antibacterial	
Castor Leaves (*Ricinus communis*) : drug worms in children	Alkaloids, Astragalin, Phytonutrients, Nicotiflorin, Kae mpferol, and Quercetin	
Turmeric (Cucuma Domistika): Itches	Curcumin, Sesmethoxycumin, Bisdesmethoxycurcumi	
Betel (*Piper betle*): Medicine Boil	Characteristic Saponins Antisep	
Star fruit wuluh (*Averrhoa bilimbi*) : Cough and Diabetes	Tannins and Terpenes	
Poop Flower Chicken (*Lantana camara*) : Colds, Hemorrhoids, Ulcers	Lutein,Marigold Also Contains Carotenoids	
Flowers Eagle (*Clitoria ternatea*) : migraine, infection wound, as well Sick head	Butterfly pea contain about 51-52% acid oleic	
Girlfriend (*Impatiens balsamina*) : Boils : Pain Waist	Coumarins,Flavonoids, Saponins, Quinones and Steroids	
Orange Stomach (*Citrus hystrix*)	Nutrients, Such as Water, Carbohydrates, Fiber, Calcium, Magnesium, Phosphorus, Potassium, Vitamin C, and Choline	
Ginger (*Zingiber officinale*): Diabetes	carbohydrates, fiber, protein, minerals, substances iron and potassium, vitamin C	
Leaf Patchouli (*Pogostemon cablin*) : It hurts Head	Oil Essentials, Flavonoids, Saponins, Tannins, Glycosides, Terpenoids and Steroids	
Leaf Bowl (*Nothophanax scutellarium*) : smoothen system digestion	Fat, Calcium, Phosphorus, Substance Iron, Vitamin A, B1 and C	

Development Stage (develop)

At stage development, the prototype project based learning model with performance assessment will be developed and rated from experts or the validator will do something testing from the due diligence product. Besides design learning models, device learning and instrument assessment used in this study development were validated by the validator. The result of product the that can utilized by teachers and students, in this matter has something stages device device-developed learning among them module guidelines use of models, lesson plans, worksheets, modules teaching materials. Besides, done drafting instrument assessment consists of evaluation competence knowledge, judgment competence attitude, judgment implementation syntax, questionnaire response users, and compilation sheet validation, as follows:

Guidelines Module Use of the PjBL Model

Draft product guideline module uses of the developed PjBL model validated by 14 experts, ie expert material learning, expert technology learning and practice learning. Validation expert done: get feedback, suggestions, comments, and corrections to product beginning for repair more carry on for refinement product. Results data analysis validation by experts with refers to the criteria validity as in Table 3. The results of the expert validation show that developed product is in valid category and presented like in Table 3 as follows.

Table 3. Validation Results Model Guide Models at Each Aspect

Aspect Evaluation	Index Aiken validation	Information
Identity	Average ≥ 0.76	Valid
Formula Objective	Average ≥ 0.83	Valid
Formula Indicator	Average ≥ 0.88	Valid
Compatibility Material	Average ≥ 0.81	Valid
Strategy Learning	Average ≥ 0.74	Valid
Activity Learning	Average ≥ 0.71	Valid
election Media	Average ≥ 0.74	Valid
Election Source Study	Average ≥ 0.79	Valid
Evaluation	Average ≥ 0.71	Valid
Use Language	Average ≥ 0.76	Valid

Lesson plan

Implementing the learning model Good PjBL expected to increase ability developing lesson plans. According to Nugraha et al., (2018) activities learning Study teaching in schools own objective that is results good study. Likewise Ahmad & Susanto (2013) stated that achievement results Study one of the students caused by the presentation model material learning provided by the teacher and the atmosphere fun learning, in develop Lesson plan, components evaluation ability this include: (1) suitability RPP components with Process Standard; (2) suitability of sub- themes learning with theme that has set; (3) precision formulate indicator learning with Basic Competency ; (4) suitability formula objective learning with indicators ; (5) precision formulate level mastery competency on indicators and objectives learning with Basic Competency; (6) clarity activity learning done students and lecturers; (7) the suitability of learning models, methods learning with objective learning; (8) suitability use of media/ tools with method learning with KI/KD; (9) usage source varied learning _ besides from book grip; (10) allocation time with materials and scenarios in Lesson plan; (11) targets intended assessment as well as type technique assessment/evaluation used. The results of the validator's Lesson plan assessment are shown in the following table.

Table 4. Results of the validator's assessment of the Lesson plan

Aspect Evaluation	Index Aiken validation	Information
suitability component Lesson plan with Standard Process	Average ≥ 0.76	Valid
suitability sub-theme learning with theme Which has set	Average ≥ 0.83	Valid
accuracy formulate indicator learning with Basic competencies	Average ≥ 0.7	Valid
suitability formula objective learning with indicator	Average ≥ 0.7	Valid
Accuracy formulate level competence mastery on indicators andobjective learning with Competence Base	Average ≥ 0.8	Valid
Clarity activity learning Which done student and lecturer	Average ≥ 0.9	Valid
suitability model learning, method learning with objective learning	Average ≥ 0.86	Valid
suitability use media/tools with method learning with KI/KD	Average ≥ 0.7	Valid
Use Learning Resources Which varied besides from book handle	Average ≥ 0	Valid
allocation time with material and scenario in Lesson plan	Average ≥ 0	Valid

Student Worksheets

Ethnoscience based Student Worksheets validation was carried out by 14 validators, including 2 Biology Education lecturers and 12 teachers in Biology. As for aspect evaluation consists of, component content, component ethnoscience, component presentation, components graphics, and language components. this relates to the results of explanatory research that the overall average evaluation expert product student workssheet validation worthy used for learning (Siska et al., 2022). that sheet Work student worthy used as learning currently Because fulfills condition feasibility, i.e. very valid, very practical, and very effective based on results evaluation of validators and responses students (Wardani & Mitarlis, 2018). Recapitulation results stage validation Student Worksheets served in Table 5 as following.

Table 5. Student Worksheet Validation Results in Each Aspect

Aspect Evaluation	Index Aiken validation	Information
Content Components	Average ≥ 0.76	Valid
Component Ethnoscience	Average ≥ 0.89	Valid
Component Presentation	Average ≥ 0.81	Valid
Component graphic	Average ≥ 0.71	Valid
Language Component	Average ≥ 0.70	Valid

Teaching Materials Module

The results of the assessment by the validator against module teaching materials consist of three aspects: aspect presentation, aspect content and language aspects. this related with results explanatory research that validation results module practice categorized as Good with a score of 87.5% is feasible for use in learning (Marjanah et al., 2022). Product results module natural science practicum analyzed consists from three category with mark percentage very valid aspects with 78% value on the element quality module. Module practice stated worthy for used as guide practicum (Nursamsu et al., 2020). Furthermore, results from aspect module inside teaching materials study can be described in Table 6.

Table 6. Validation Results Teaching Materials at Each Aspect

Aspect Evaluation	Index Aiken validation	Information
Content Components	Average ≥ 0.80	Valid
Component Presentation	Average ≥ 0.73	Valid
Language Component	Average ≥ 0.71	Valid

Stage Testing Enhancement Ability Think Critically

Enhancement Skills think critical student can is known after the PjBL model is developed and implemented in learning. Implementation of the developed PjBL Model among them module guidelines use of models, lesson plans, worksheets, modules appropriate teaching materials for used. Upgrade data Skills think critical obtained from results test Skills think critically done pretested and post-tested consisting learning from six SMA Negeri 1 Manyak Panyed, SMA Negeri 2 Patra Nusa, SMA Negeri 1 Langsa, SMA Negeri 5 Langsa, SMA Negeri 1 Sungai Raya and SMA Unggul Aceh Timur. Enhancement ability Skills think critical student can seen from pretest and posttest results that have been obtained later counted with the average normalized gain score. Enhancement ability cognitive student can seen in the Figure 2.
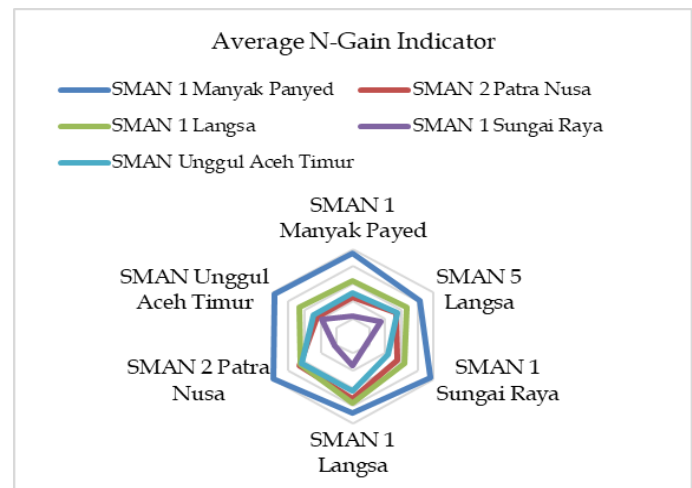

Figure 2. N-Gain Results of Critical Thinking Ability for Each School

From Figure 2 it is known that mark pretest and posttest consisting of learning from six schools, experience enhancement Skills think critically. The magnitude enhancement the can see from n-gain values for each SMA Negeri 1 Manyak Panyed with value of 0.36, SMA Negeri 5 Langsa with value of 0.39, SMA Negeri 1 Sungai Raya with value of 0.36, SMA Negeri 1 Langsa with value of 0.48, SMA Negeri 2 Patra Nusa with value of 0.48 and SMA Negeri Unggul Aceh Timur with value of 0.41, with each school are in category medium. However, the size enhancement skills think critically the is at SMA Negeri 1 Langsa.

Related with results study about PjBL model development to enhancement ability think critical student by results explanatory research. Enhancement Skills think critical students who use developed integrated science teaching materials including in criteria moderate (Hilda et al., 2019). The MANOVA test results show that the Malcom's Modeling Method model can increase Skills think critical and motivational Study students at level significance of 5% (Syarifah & Sumardi, 2015).

Conclusion

Conclusion from this research and development are (1) Project Based Learning Model with Based performance assessment ethnoscience can applied as device learning in students at each school target ; (2) Project Based Learning Model with based performance assessment ethnoscience worthy used For device consisting learning _ from results validation module guidelines use of models with mark Vaiken ≥ 7.73, the results of the validator's assessment of lesson plans with mark Vaiken ≥ 8.08, Worksheet Validation Results Participant Educate with mark Vaiken ≥ 7.74 and Validation Results Teaching Materials with mark Vaiken ≥ 7.46, from evaluation validation consists from Field Lecturers and Teachers studies biology with category "Very Good "; (3) 3. Improvement test results think critical from ability students in each - each school target study with the average N-gain value of 0.41 is stated exists enhancement student in ability think critical about learning ethnoscience

Author Contribution
Elfrida: Critical revision of manuscript, Supervision. Nursamsu: Concept, design, drafting, data analysis. Siska Rita Mahyuny: data acquisition, data interpretation. Binari Manurung: Content validation, supervision, final approval

Conflicts of Interest
There are no problems that occur in research

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