

Prof. H. Yaya S. Kusumah, M.Sc., Ph. D. Director of School of Postgraduate Studies Universitas Pendidikan Indonesia

Dr. H.Suyyani Prabawanto, M.Ed.

Conference Chair

# Book of Program



May 5", 2018

International Conference on Mathematics and Science Education

"Promoting 21" Century Skills Through Mathematics and Science Education"

> Sekolah Pascasarjana Universitas Pendidikan Indonesia



# Parallel Session, ICMScE 201

No	Time (WIB)	Rooms and ID ABS Number											
		R21	R22	R23	R24	R25	<b>R26</b>	<b>R27</b>	<b>R28</b>	R29	<b>R30</b>	R31	R32
1	13.00 - 13.10	111	183	270	342	405	492	550	610	671	722	52	28
2	13.11 - 13.21	112	189	277	351	413	495	552	611	677	734	123	155
3	13.22 - 13.32	120	191	293	360	420	497	553	614	678	735	160	217
4	13.33 - 13.43	121	193	297	362	423	513	557	623	679	738	184	247
5	13.44 - 13.54	126	209	301	364	424	516	558	625	682	739	233	290
6	13.55 - 14.05	127	214	304	365	428	517	563	626	684	743	246	327
7	14.06 - 14.16	134	215	308	373	446	518	564	630	687	744	268	392
8	14.17 - 14.27	136	216	309	377	447	521	568	634	689	745	382	472
9	14.28 - 14.38	138	223	310	381	450	523	571	644	690	748	442	474
10	14.39 - 14.49	146	225	314	384	452	527	578	645	691	751	451	475
11	14.50 - 15.00	147	226	315	386	455	533	586	647	692	754	496	562
12	15.31 - 15.41	149	235	316	387	461	537	587	655	694	755	543	580
13	15.42 - 15.52	158	243	317	388	476	539	588	657	695	764	546	590
14	15.53 - 16.03	159	245	323	390	479	541	591	659	699	773	629	600
15	16.04 - 16.14	165	248	329	396	483	542	596	664	702	780	705	601
16	16.15 - 16.25	175	319	332	397	485	545	597	665	711	797	782	605
17	16.26 - 16.36	30	253	333	400	486	547	598	666	716	800	787	617
18	16.37 - 16.47	162	266	334	404	487	548	608	669	74	803	808	668
19	16.48 - 16.58		206		125	489	536	609	643	637	616	811	707
20	16.59 - 17.09											812	810
21	17.10 - 17.20											809	429
22	17.21 - 17.31											436	758

#### Note;

# FPMIPA A BUILDING

R1: 2nd floor, number E.201 R2: 2nd floor, number E.210 R3: 3rd floor, number S.301 R4: 3rd floor, number S.302 R5: 3rd floor, number S.303 R6: 3rd floor, number S.304 R7: 3rd floor, number S.305 R8: 3rd floor, number S.306 R9: 3rd floor, number E.301 R10: 4th floor, number E.405 R11: 4th floor, number E.406

# FPMIPA C BUILDING

R26:2nd floor, number IK. 201 R27:2nd floor, number IK. 202 R28:2nd floor, number IK. 203 R29:2nd floor, number IK. 204 R30: 2nd floor, number IK. 206 A R31: 2nd floor, number IK. 206 B R32: 2nd floor, number IK.207

#### **FPMIPA B BUILDING**

R12: 1st floor, number B.106 R13: 1st floor, number B.108 R14: 2nd floor, number B.201 R16: 2nd floor, number B.204 R17: 2nd floor, number B.205 R18: 2nd floor, number B.209 R19: 2nd floor, number B.210 R20: 3rd floor, number B. 301 R21: 3rd floor, number B. 303 R23: 3rd floor, number B. 305 R24: 4th floor, number B. 404 R25: 4th floor, number B. 405

# [ABS-392]

# Profile of Pre-Service Biology Teachers Critical Thinking Skills Based on Learning Project toward Sustainable Development

# J Jumrodah, S Liliasari, and Y Hilmi Adisendjaja

 Program Studi Pendidikan IPA, Sekolah Pascasarjana, Universitas Pendidikan Indonesia Jl. Dr. Setiabudhi No. 229, Bandung 40154, Indonesia
 Program Studi Tadris Biologi, Institut Agama Islam Negeri Palangka Raya, Indonesia

# Abstract

The aims of this research are to describe the pre-services Biology teacher critical thinking skills, based on learning project to build their sustainable development competencies. This research used survey method. The subject was consists of 19 pre-service teacher on 6th semester in one of university in Palangka Raya. The instruments using test Laurent Starkey and questionnaire. The data analyzed using quantitative descriptive analysis technique. The result show that students critical thinking was low (26%) and lower (74%) categories. The other result showed that the instructional has not led to either project base sustainable development or critical thinking during the class. It is suggested to develop project-based learning toward sustainable development to improve critical thinking skills.

Keywords: Pre-Service Biology Teachers, Critical thinking skills, Based on Learning Project, Sustainable Development

# Appendix THE LIST OF ACCEPTED FULL PAPER FOR ICMSCE 2018

NO	ABS	AUTHORS	TITLE	AFILIATION	STATUS	PAPER STATUS	DECISION	PAYMENT
281	384	DI Rahmawati, N Priatna, and D Juandi	Algebraic thinking characteristics of eighth grade junior high school students based on Superitem Test of SOLO model	UPI	Student		ACCEPTED WITH MINOR REVISION	IDR 750,000
282	385	Sri Fatmawati	Enhancing the Students' Creative Thinking Skills through Web Blog -Assisted <i>Cooperative</i> <i>Integrated</i> <i>Reading and Composition</i> (CIRC) Learning	NON UPI	Non Student		ACCEPTED WITH MINOR REVISION	IDR 850,000
283	386	Arif Widayanto, Hasih Pratiwi, and Mardiyana	Student's thinking processes on Bloom's taxonomy: exploring direct instruction learning model	NON UPI	Student		ACCEPTED WITH MINOR REVISION	IDR 750,000
284	387	A Aprisal and A M Abadi	Mathematical communication ability of students viewed from self-efficacy	NON UPI	Student		ACCEPTED WITH MINOR REVISION	IDR 750,000
285	388	H Beeh, R Rosjanuardi, and A Jupri	Investigating The Misconception of Studentsin Initial Algebra	UPI	Student		ACCEPTED WITH MINOR REVISION	IDR 750,000
286	389	Mulyadi, Ghery Priscylio , Parlindungan Sinaga, Diana Rochintaniawati	Needs of Integrated Science Experiment Student Worksheet in Junior High School to Improve Students Science Process Skills	UPI	Student		ACCEPTED WITH MINOR REVISION	IDR 750,000
287	390	M Meiriyanti , S Suhendra, and E Nurlaelah	Improving mathematical communication ability through problems based learning model	UPI	Student		ACCEPTED WITH MINOR REVISION	IDR 750,000
288	392	J Jumrodah, S Liliasari and Y Hilmi Adisendjaja	Profile of Pre-Service Biology Teachers Critical Thinking Skills Based on Learning Project toward Sustainable Development	UPI	Student		ACCEPTED WITH MINOR REVISION	IDR 750,000
289	393	N Kamil and J Jailani	Improving self-confidence with active knowledge sharing model on mathematics learning in primary school	NON UPI	Student		ACCEPTED WITH MINOR REVISION	IDR 750,000

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# Profile of pre-service biology teachers critical thinking skills based on learning project toward sustainable development

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# **Profile of pre-service biology teachers critical thinking skills** based on learning project toward sustainable development

J Jumrodah<sup>1,2\*</sup>, S Liliasari<sup>1</sup> and Y H Adisendjaja<sup>1</sup>

<sup>1</sup>Program Studi Pendidikan IPA, Sekolah Pascasarjana, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudhi No. 229, Bandung 40154, Indonesia <sup>2</sup>Program Studi Tadris Biologi, Institut Agama Islam Negeri Palangka Raya, Indonesia

\* jum\_rodah@student.upi.edu

Abstract. The aims of this research are to describe the pre-services Biology teacher critical thinking skills, based on learning project to build their sustainable development competencies. This research used survey method. The subject was consists of 19 pre-service teacher on 6<sup>th</sup> semester in one of university in Palangkaraya. The instruments using test Laurent Starkey and questionnaire. The data was analyzed using quantitative descriptive analysis technique. The result show that students critical thinking was low (26%) and lower (74%) categories. The other result showed that the instructional has not led to either project base sustainable development or critical thinking during the class. It is suggested to develop project-based learning toward sustainable development to improve critical thinking skills.

#### 1. Introduction

The goals of learning in university are to provide students with critical thinking skills [1, 2, 3]. Everyone needs critical thinking skills to be successful in solving the problems in difficult situations and having effective and acute communication with others. [4]. Critical thinking skills can help students have a critical view of the problems that occur in society and try to overcome them [4, 5]. Critical thinking skills are the ability to think reflectively and skillfully assess, so students can decide kinds of information that appropriate and kinds of actions should be taken during reasoning and problem solving [6]. The term critical thinking skills refers to many skills such as identifying, analyzing, synthesizing, and evaluating information for decision making, and disposition to apply skills [1, 7, 8, 9, 10].

One of the 21<sup>st</sup> century education goals is to prepare students to understand deep knowledge and apply effective critical thinking skills to cope with the challenges in the ever-changing society [4, 6]. To address the challenges facing the global community, the education system can change the values, attitudes and behavioral patterns to bring about social change [11]. Through education and research students are creatively and critically stimulated to explore the role of sustainable development practices in all areas of human activity in the community [11, 12, 13, 14]. The focus area that can be used to gain the critical thinking skills are toward sustainable development in biological environmental.

Project-based learning is based on a constructive approach as it is designed to motivate students to be more actively involved in learning activities to produce tangible products [15, 16, 17, 18]. Projectbased learning provides students with opportunities to learn, develop careers, solve problems, team collaboration, perform creative challenges, provide opportunities to work relatively independently for longer periods, and produce real products, because one of the 21st century skills is to enablestudents to

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collaborate with one another to analyze the problem critically, so as to develop creative ideas to design a real project relevant to the material presented [4, 15, 16, 18, 19].

Some researchers suggest that project-based learning can improve critical thinking skills, because it contain activities refers to interpretation of collected data, predicting results, drawing conclusions, and presenting results [15]. Project-based learning is collaborative in order to improve innovation in generating project tasks [17]. Based on the description, it is important to see the critical thinking profiles on project-based learning toward sustainable development.

# 2. Experimental method

This study is a survey research at one of the universities in the city of Palangkaraya. The survey involved 19 pre-service teachers of sixth semester. The subjects of the study were taken with the consideration that they enrolled in the marine ecology course. Data critical thinking skills were collected through the standard instrument of critical thinking skills by Laurent Starkey [20] with 10 items questionnaire. The Data analyzed using quantitative descriptive analysis technique.

### 3. Result and discussion

# 3.1. Critical thinking skills profile

The result of data analysis shows that profile of pre-service biology teachers' critical thinking skills can be categorized as very low (74%) as shown in figure 1.

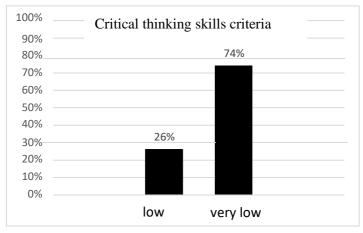


Figure 1. Pre-service teacher's critical thinking skills profile.

Figure 1 shows the 6<sup>th</sup> semester pre-service biology teachers critical thinking skill at the Tadris Biology Program. As seen on figure 1, there are 26% critical thinking skills with low category that has not been able to answer questions relating to focusing questions, observing and considering observation reports and concluding induction. After that there are 74% students have very low categories in critical thinking skills, because of the inability to answer questions related to the consideration of whether the source is reliable, make deductions, identifies assumptions and determines of an action. No data was found in medium, high, and very high categories so it can be concluded that the critical thinking skills of Biology pre-service teachers are in very low category. Most of subject cannot answer the 3 indicators of critical thinking skills, i.e. build basic skills, conclude and organize strategies and tactics. This finding is in line with previous research results that students have weaknesses in explaining, conclusion and evaluating [6, 21, 22, 23, 24]. To improve critical thinking skills students, four strategies are needed in the learning process that is: enough time to think about problem solving, organize groups to discuss problem solving, presentations to discuss their projects, and reflection exercise [6]. Characteristics of learning methods have an important role to improve students' critical thinking skills required to respond or answer

questions, problems, or challenges, not just to memorize, recognize, and choose the correct answer of the responses [1].

Based on these finding, it can be said that learning has not fully provided critical thinking skills to pre-service biology teacher, university should be provide critical thinking skills and problem solving, because these skills will be needed working in the world 21<sup>st</sup> century [1]. The 21<sup>st</sup> century era of globalization people in the world are expected to be able to face the arena of global competition [25]. Critical thinking skills indicator

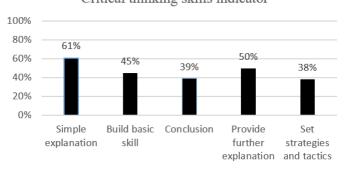
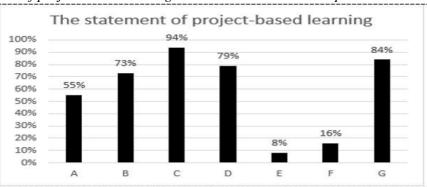


Figure 2. The result of critical thinking skills categories.

Figure 2 shows critical thinking skills pre-service biology teacher using the Ennis framework with indicators [21]: (1) 61% show gives a simple explanation skill; (2) 45% show building basic skill; (3) 39% show concluding skill; (4) 50% show further explanation skill; and (5) 38% show strategy and tactic skill. Based on the data, it appears that there are two critical thinking skills that are more managed, that is giving a simple explanation and provide further explanation.

The result of data obtained is in line with the interview result that the learning so far gives only the task in the form of paper then presented without giving emphasis have not been clear on the concepts. It should not only provoke students through challenging questions to see problems from different perspectives, but also support provide in the form of explaining abstract concepts and facilitating well-organized presentations and opportunities providing for applying concepts and evaluating them. The development of critical thinking skills requires teachers to balance cognitive challenges with intellectual support, as suggested by Sanford (1966) [1].



*3.2. The statement of project-based learning towards sustainable development* 

A; analysis of problems associated with the real world aspect, B; projects in student design or assisted by lecturers aspect, C; the ability to find reference that relate to the project aspect, D; facilitated by campus or personal aspect, E; followed up with the exhibition to get the general public's response, F; utilization of project tasks aspect, G; creative and imaginative to produce a sustainable project show

**Figure 3.** The statement of project-based learning students towards sustainable development.

Figure 3 shows that the questionnaire given to the respondent aims to find out the extent of the projectbased learning process during the course of the environmental biology course. Based on the data analysed the average percentage shown are 58% and it can be interpreted that the response of pre-service biology students with project-based learning to sustainable development is good enough.

Based on the results, the problem analysed aspect on the real world environmental biology material, related to the project task showed score of 55%, it's mean that the respondents stated has not been completely directing the project based on the existing problems. The student's project design were about 73% done by themselves. The data show that make proposals, create teaching materials and 3-dimensional workshops with Styrofoam materials and herbarium are created by themselves.

Aspects of the ability to search for references via the internet and libraries associated with the project task 94%. This data indicates that the respondents have the independence and responsibility to complete the tasks that have been given. Through ICT students can find information in creating products, can also collaborate more effectively, and connect with experts and partners around the world [26,27].

The aspect of working on the project tasks is facilitated by personal (79%). These data indicate that respondents spend more on personal costs than campus facilitation. The project result aspect was followed up with an exhibition to get a general public response (8%). The data indicate that respondents had never done the exhibition. Because result the product from the project task so far only herbarium, proposal, 3-dimensional enzymes model, teaching materials, and soya fermentation, is not a project that can provide economic and social added value toward sustainable development. Aspects the project task utilization to the general public (16%). These data indicate that the resulting product does not provide benefits for real life sustainable.

Aspects have creative power and imagination to produce sustainable projects (84%). This data can be interpreted that respondents have the innovation and creativity to produce project tasks that sustainable increase the economic value of society in a. But talent has not been facilitated in learning environmental biology materials. Aspects of learning about the cultivation of sea urchins and sea cucumbers (0%). This data can be interpreted that none of the respondents have been taught about the cultivation of marine biota. The role of education in global development has a responsibility to challenges the 21<sup>st</sup> century by fostering values, attitudes, competencies and skills to empower individuals in the current and future economic, social, cultural and environmental sectors, from a local and global perspective toward sustainable development [28].

The findings of this research have implications that project-based learning provides the impetus for analyzing problems and providing solutions by producing sustainable development projects and gaining a pleasant experience. These projects involve critical thinking skills and creative thinking skills through interpretation of collected data, analyzing environmental issues at both the micro and macro levels in relation to environmental sustainability leading to social change, predicting outcomes, providing solutions, drawing conclusions, and presenting results [11,15,19]. The research demonstrates constructivist principles with a project-based convergent model to facilitate collaborative and creative learning to encourage students to study materials related to environmental biology [15, 26].

### 4. Conclusion

Based on the result of data analysis, it can be concluded that generally the critical thinking skill profile of pre-service Biology teachers are categorized very low. In addition, the response of students with project-based learning towards sustainable development is quite good. Project-based learning taught so far has not resulted in a project task that is beneficial to the community in a sustainable manner nor has the exhibition ever done to get a response from public generally. Project-based learning into sustainable development can be used as a reference in developing the design of learning activities to improve critical thinking skills. The learning process can be organized and conditioned on learning situations by analyzing problems and making decisions so as producing real projects useful for social change towards sustainable development. On the other hand, developing critical thinking skills is an essential skill that must be possessed by prospective biology teachers.

# Acknowledgments

The authors would like to thanks for all the students who have participated in the data collection. The authors would also like to send a gratitude to the lecturers who have given the opportunity to conduct this survey.

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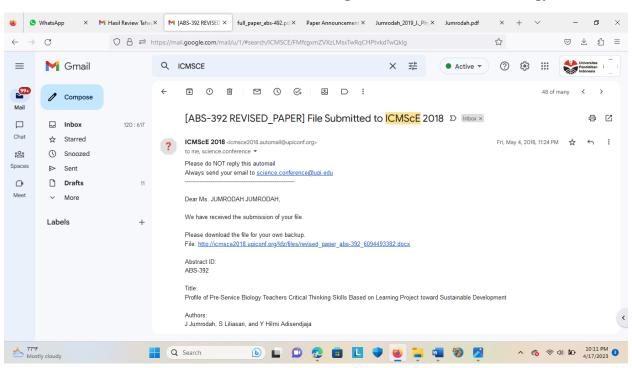
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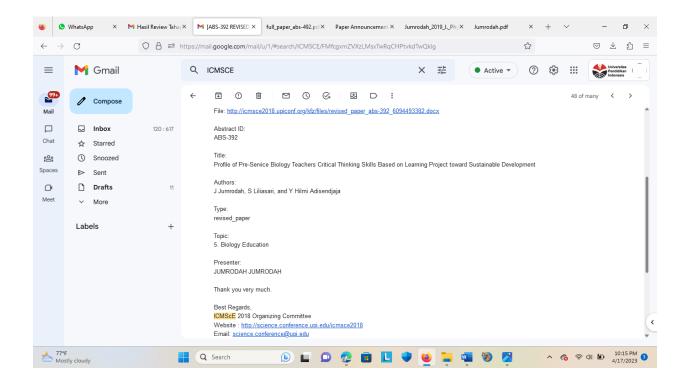
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