

The Effect of Prior Knowledge on Students' Learning Outcomes on the Subject of Basic Science Concepts

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Abstract: This study aims to determine the direct effect of prior knowledge on students' learning outcomes in subject of basic science concepts in the Primary Education Department of the Faculty of Education, Gorontalo State University. This study used a survey method, and the techniques of data collection were questionnaires and learning outcomes tests. The data were analyzed using descriptive and inferential with a path analysis approach (path analysis). The population were 202 undergraduate students of Department of Primary Education, State University of Gorontalo, who participated in the basic science concept subject and, 130 students were the sample of this study. The results of the study found that prior knowledge had a positive effect on Science learning outcomes, namely there was a positive direct effect of prior knowledge on students' learning outcomes in the basic science concept subjects. Prior knowledge could be strengthened by improving lecture activities through connecting students' knowledge and past experiences before taking their lectures and that will lead to a science learning experience. Prior knowledge can process learning to enhance better learning outcomes in the topic of living things, not only plants and animals, but also humans. This shows that sound prior knowledge will be able to improve the learning outcomes of primary education students in subject of the basic science concept.

Keywords: prior knowledge, learning outcomes, science

I. INTRODUCTION

Cooperation and supports from higher education institution, in this case, the Department of Elementary School Education (throughout this paper will be referred to as PGSD) are needed in producing qualified elementary school teachers. To achieve this objective the PGSD department of Faculty of Education of Universitas Negeri Gorontalo has started to improve its teaching and learning process. Learning output is the most important thing in learning. Susanto (2013) defined learning output as changes on students, either in cognitive, affective, and psychomotor aspects as a result of learning activity. In addition, Gagne (Jufri, 2013) defined learning output as observable performance in a person that can be called as capability. According to Gagne, there are five categories of capabilities in human being, namely: (1) intellectual skill, (2) cognitive strategy, (3) verbal information, (4) motoric skills, and (5) attitude.

Students learning output are abilities such as cognitive, affective, and psychomotor capabilities that they obtained following the learning experience. Learning output can be detected through a series of evaluation aimed at gathering information in the form of data to prove students' ability in attaining the learning objectives. The learning output achieved by students is the result of interaction between students and other learning components.

The reality, especially in the basic concept of Natural Science (throughout this paper will be referred to as IPA) subject, is that students find it very difficult to apply the IPA concept into theories and practices. Based on the observation result, several problems regarding the IPA learning at students of PGSD were found. These problems have consequences such as low learning output. This low learning output was due to the characteristics of

the PGSD students who came from various educational background such as from General High School and Vocational high schools with various department, habits, and attitude, lack of laboratory facilities, no internet connection, and lack of library facilities and lack of new books collection, as well as lack of lecturers' services for students due to their high level of activities outside the university.

II. METHOD

This study was implemented in the department of Elementary School Teacher Education (PGSD) of the Education Faculty of Universitas Negeri Gorontalo. The samples in this study were students of the second year with the total population of 202 students and the 130 students as sample selected using the sampling process. This study was carried out in the form of survey. The variable in this study was independent variable (exogenous) and dependent variable (endogenous). The exogenous variable was prior knowledge(X), whereas endogenous variable was Students' Learning Output (Y).

The data analysis was descriptive analysis and inferential analysis. The descriptive analysis was carried out by presenting the data through table of frequency, histogram, average, and standard deviation. Meanwhile, inferential analysis was carried out to test the hypothesis. The hypothesis analysis was carried out through regression and correlational analysis. Before the hypothesis was tested the data normality was tested using Liliefors. The pathway statistical analysis was administered for hypothesis testing.

III. RESULTS AND DISCUSSION

The description of the data presented below are the learning output data (Y) as endogenous variable, and prior

knowledge (Y). Based on the data (Table 1), it was obtained that the mean of the data was 44.18; the data median was 40.83; and modus was 34. The frequency distribution was put into the frequency table, and 9 classes were obtained with the minimum score of 20 and the maximum score of 84; thus the largest score range was 64; the detailed result is presented in Table 2.

Table 1
Description of Data from Each Variable

Research Variable	Number of Item	Theoretically		Empiric	
		Min	Max	Min	Max
Learning Output (Y)	25	25	125	20	84
Prior knowledge(X)	23	23	115	48	100

Table 2
Data Distribution Frequency of Students' Learning Output

No.	Class Interval	f _i	f _{relative (%)}	X _i	f _i .X _i
1.	20-27	17	13,08	23,5	399,5
2.	28-35	30	23,08	31,5	945
3.	36-43	27	20,77	39,5	1066,5
4.	44-51	18	13,85	47,5	855
5.	52-59	13	10,00	55,5	721,5
6.	60-67	13	10,00	63,5	825,5
7.	68-75	5	3,85	71,5	357,5
8.	76-83	5	3,85	79,5	397,5
9.	84-91	2	1,54	87,5	175
Σ		130	100		5743

Table 1 shows that the frequency distribution of the learning output variable was a positive curve. This indicates that the average values were larger, and the median was also larger than modus. Further, it could be seen that 13 respondents or 10% were within the average group, 41 respondents (70.78 %) were above the average group, and 76 respondents (19.22%) were below average group. Distribution of learning output variable is presented in the histogram below (Figure 1).

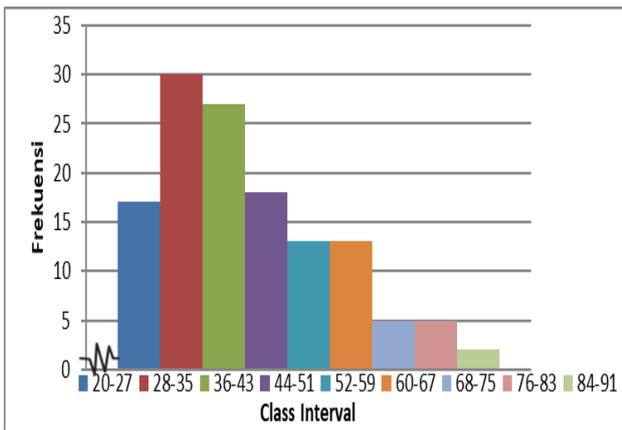


Figure 1
Learning Output Histogram

Based on the result, it was obtained that the prior knowledge: the mean value was 77.47; with the median was 79.5; and modus was 81.5. Distribution of frequency was made into seven classes with the minimum score of 48 and the maximum score of 100; thus, the score range was 52, and the result is presented in Table 3 below.

Table 3 shows that the frequency distribution of students' prior knowledge score was a negative curve.

This shows that there were a relatively smaller average score and smaller median than modus. Further, it shows that there were 35 respondents (26.92%) were within the average group; 61 respondents (23.07%) were above the average categories, and 34 respondents (49.99%) were below the average group. Score distribution of learning output variable was presented in histogram of Figure 2 below.

Table 3
Frequency Distribution List of Students' Prior knowledge score

No.	Interval Class	f _i	f _{relative (%)}	X _i	f _i .X _i
1.	48-55	10	7,69	51,5	515
2.	56-63	8	6,15	59,5	476
3.	64-71	12	9,23	67,5	810
4.	72-79	35	26,92	75,5	2642,5
5.	80-87	49	37,69	83,5	4091,5
6.	88-95	7	5,38	91,5	640,5
7.	96-103	9	6,92	99,5	895,5
Σ		130	100		10071

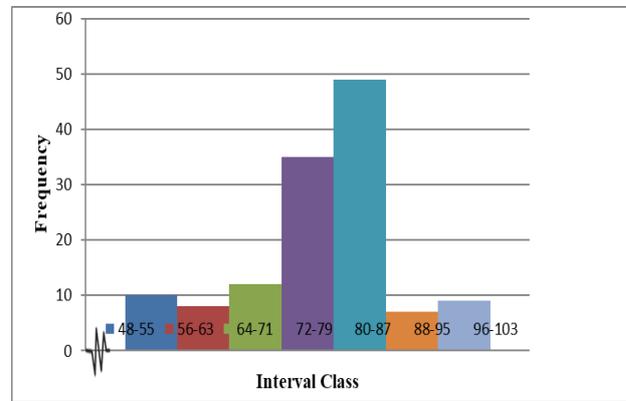


Figure 2
Prior Knowledge Histogram

The regression formula for students' learning output and prior knowledge on X1 was $\hat{Y} = a + bx$ or $\hat{Y} = -18.90 + 0.793X$. This formula produced the $F_{count} = 69.35$ and the significance level of $\alpha = 0.005$; it was obtained that the $F_{table} = 3.91$; thus $F_{count} = 69.35 > F_{table} = 3.91$; Thus, the linear regression formula was highly significant (Table 4). This means that each increase of prior knowledge score of the students would influence the students' learning output by 0.793 in the constant of -18.90.

Based on the regression equation, it was obtained that $\hat{Y} = -18.903 + 0.793X_1$. Clearly, that each increase of prior knowledge score would be followed by the increase of students' learning outcome in the subject of Basics Concept of IPA 2 or the more effective the prior knowledge implementation, the better the increase of students' learning outcome IPA 2 subject. The influence of prior knowledge on students' learning outcome in Basic Concept of IPA 2 subject was supported by the pathway coefficient of 0.152, where the $t_{count} = 2.10 > t_{table} = 1.645$ in the significance level of $\alpha = 0.05$; thus, the H_0 was rejected, and H_1 was accepted, which means that the pathway coefficient between prior knowledge and students' learning output in Basic Concept of IPA 2 was significant. This shows that there was a direct positive influence on students' learning output in Basic Concept of IPA 2 subject.

Table 4
The Variance Analysis of Linear Regression Test (Y on X₁)

Variable Contribution	JK	Db	RJK	F _{count}	F _{table}	
Total	271312,00	130	2087,02		$\alpha=0,05$	$\alpha=0,01$
Coefficient (a)	238139,20	1	238139,20			
Reg (a/b)	11657,40	1	11657,40	69,35	3,91	6,81
Residue (S)	21515,41	128	168,09			
Tuna Cocok	2770,08	11	251,82	1,57	1,84	2,4
Galat	18745,33	117				

From this finding, it showed that the existence of prior knowledge is considered as the most essential part of increasing the students' learning output in Basic Concept of IPA 2 subject. The result of this study supports the result of Liliyasi and Rahmatan (2012) where they found that prior knowledge is a collection of individual knowledge, experience obtained in their whole life, and that they would bring those into a new learning experience. Students have characteristics that they brought forward from the previous level of education. This diversity influences their learning. Prior knowledge could process learning into a better learning result. Dochy (Prastiti, 2007) wrote that prior knowledge is defined as all of the intellectual knowledge of a person due to: (1) it has existed before the learning; (2) it was structured within the schemata; (3) as declarative and procedural knowledge; (4) partly explicit; (5) consists of content and metacognitive knowledge; and (6) dynamic within its nature and stored within the basis of prior knowledge.

In relation to the prior knowledge of the students in the Basic Concept of IPA subject toward their learning outcome, it was strengthened by Roschelle (1997): a large body of findings shows that learning proceeds primarily from prior knowledge, and only secondarily from the presented materials. Prior knowledge can be at odds with the presented material, and consequently, learners will distort presented material. Neglect of prior knowledge can result in the audience learning something opposed to the educator's intentions, no matter how well those intentions are executed in an exhibit, book, or lecture.

Basically, the IPA learning with prior knowledge orientation would create learning outcome that plays an important role in the establishment of IPA knowledge in a learning process and would have an impact on improving the knowledge acquisition in the form of increase of students' learning outcome. The implication of this present study is that the IPA learning with prior knowledge orientation would increase students' learning outcome. In contrary, learning that neglects the prior knowledge of students would not achieve the expected outcome in IPA learning process such as lack of students' learning outcome in Basic Concept of IPA subject.

IV. CONCLUSION

Based on the findings and discussion above, the following conclusion is reached: there was a positive and direct influence of prior knowledge toward students' learning outcome in Basic Concept of IPA. The prior knowledge, which strengthened by improving the lecturing activities such as students' knowledge and experience obtained during their previous study would have an impact on their IPA learning experience. Prior knowledge could process learning to obtain a better learning outcome, such as learning of living creatures,

plants, animal, or human. This shows that good prior knowledge would be able to increase PGSD students' learning outcome in the Basic Concept of IPA subject.

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REFERENCES

- [1] Abdurrahman. 2015. *Guru IPA sebagai Motivator*. Yogyakarta: Media Akademi.
- [2] Dalton, S. S. 2017. *Pengajaran yang Efektif bagi Semua Pebelajar*. Jakarta: Indeks.
- [3] Fatona. 2010. *Pembelajaran IPA*. Yogyakarta: Ombak.
- [4] Grafura, L. 2016. 100 Masalah Pembelajaran. Yogyakarta: Ar-ruzz media.
- [5] Gredler, E. M. 2011. *Learning and Instruction Teori dan Aplikasi*. Jakarta: Kencana Prenada Media Group.
- [6] Ifenthaler, D. 2011 *Multiple Perspectives on Problem Solving and Learning in the Digital Age*. Germany: Spinger.
- [7] Jihad, A. 2012. *Evaluasi Pembelajaran*. Yogyakarta: Multi Pressindo.
- [8] Jufri, W. 2013. *Belajar dan Pembelajaran IPA*. Bandung: Pustaka Reka Cipta.
- [9] Jufri, W. 2017. *Belajar dan Pembelajaran IPA*. Bandung: Pustaka Reka Cipta.
- [10] Mairingin, P. J. 2017. *Statistika Pendidikan Konsep & Penerapannya Menggunakan Minitab dan Microsoft Excel*. Yogyakarta: Andi Offset.
- [11] Pellegrino, J. W. 2006. *Rethinking and Redesigning Curriculum, Instruction and Assessment: What Contemporary Research and Theory Suggests*. New York: National Center.
- [12] Roschelle, J. 1999. *Prior Knowledge*. San Francisco: Exploratorium.
- [13] Sagala, S. 2010. *Konsep dan Makna Pembelajaran*. Bandung: Alfabeta.
- [14] Sanjaya, W. 2008. *Kurikulum dan Pembelajaran Teori dan Praktek Pengembangan Kurikulum Tingkat Satuan Pembelajaran*. Jakarta: Kencana.
- [15] Santrock, J. W. 1999. *Lifespan Development*. Boston: McGraw-Hill.
- [16] Sary, E., & Yessy, N. 2015. *Psikologi Pendidikan*. Yogyakarta: Parama Publishing.
- [17] Slavin, E. R. 2017. *Psikologi Pendidikan*. Jakarta: Indeks.
- [18] Slavin, E. R. 2001. *Educational Psychology*. Boston: McGraw-Hill.
- [19] Susanto, A. 2013. *Teori Belajar dan Pembelajaran di Sekolah Dasar*. Jakarta: Kencana.