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Impacts of inquiry learning model on students' cognitive and critical thinking ability

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Abstract

This article describes the effects of inquiry learning model on college students' cognitive and critical thinking skills. The research aims at understanding the extent inquiry learning model improves the college students' cognitive and critical thinking skills in the lessons of educational philosophy and exploring students' responses to the model. This is a pre-experimental research design, using the one group pretest-posttest design. The samples of the study were an intact class, the experimental group and no control group is needed. The data was analysed using independent test samples t-test and Normalized Gain test. The Research found that the inquiry model is effective in improving college students' cognitive and critical thinking ability in an educational philosophy class. Overall, the N-Gain indicator of cognitive ability increased by an average of 0.66, and the N-Gain indicator of critical thinking skills increased by an average of 0.63.

Keywords: Congnitive skill, Critical thinking, Inquiry learning, Educational Philosophy, College Student

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1. Introduction

Lecturing is not a matter of only organizing and delivering materials per se, it should also aim toward fostering changes in students' wellbeing. Lecturers are working towards providing effective instruction using certain strategies/approaches and presenting a contextual learning atmosphere to allow students develop cognitive, affective, and psychomotor skills during the learning process. These three domains can only be well improved through an active learning. Sudjana and Ahmad (2017) stated the improvement of student's skills can be obtained through learning experience leading to students' learning success. They further stated that for students to succeed, they need to develop all three domains (Sujana & Ahmad, 2017).

According to Law No. 20 of 2003, article 1 paragraph 20 implicitly describes the learning process only takes place during interactions between learners and teachers, and in relation to learning resources in the learning environment (Depdiknas, 2003). Dimyati and Mudjiono (2011) state that to create active learning, teacher should consider using appropriate instructional designs that works effectively (Dimyati & Mudjiono, 2011). On the other hand, learning that only emphasizes on the mastery of concepts, reduce students' innovation skills. Slameto (2003) explains that effective learning process occurs, if educators (lecturers) are actively engaged in the classroom; since it is essential that teachers direct students to achieve learning goals through engaging them actively during the learning process (Slameto, 2003).

Educational Philosophy is a compulsory course in the field of education. It aims at developing students' knowledge on theories of scientific development from the lens of various philosophical schools of thought. Students studying basic education course consider Educational Philosophy as a rather elusive course. They have not been skilled at analyzing and determining various references on the basic of scientific concepts in the Philosophy of Education. Students are also not very familiar with the terms used in these courses, such as characteristics and branches of philosophy or concepts of metaphysics, epistemology, ontology, axiology, anthropology, and others. In fact, in educational philosophy course, students passively absorb the lecturers' explanation during instruction, and thus no space is given to students to engage in the learning process, which turns them to be passive. As the result, they are less skilled in to be knowledge seekers during the learning process.

To overcome students' problems in understanding the course and make it easier for students, the authors offers alternative models of active learning, which not only prioritizes ability in the cognitive sphere but is also able to develop affective and psychomotor abilities, which then enable students to improve their specific skills. One of the models to be developed by lecturers is through a guided inquiry model. Therefore, it is important to explore the extent, in which an inquiry model improves cognitive ability and critical thinking skills in the philosophy of education course and students' responses to the model and feedback during class discussions.

Cognitive ability is the ability of learners to acquire learning materials through independent of knowing, understanding, applying, analyzing, and evaluating. In addition, critical thinking is another important competence needed to succeed in learning. According to Johnson (2009) in Kuswana and Sunaryo (2011), critical thinking is a process of systematic evaluation by learners about evidence, opinions or perceptions, and logics on certain issues. Kuswana and Sunaryo (2011) further define critical thinking as thinking objectively based on a decision that is believed to be true (Kuswana & Sunaryo, 2011). This activity can be improved for learners through an ongoing training process. It is therefore believed that a person's critical thinking skills can be trained (Setiawan, 2011).

Jensen and Eric (2011) argue that to obtain knowledge, which is in accordance with the truth can be done through an effective and reliable mental process called critical thinking (Jensen & Eric, 2011). Alec (2009) states that critical thinking is a continuous and accurate active estimation of a belief and knowledge obtained based on various objective reasons (Alec, 2009).

According to Ennis in Sutarno (2013), there are several critical thinking indicators used as a reference for critical thinking studies in learning, which consists of (a) exploring the clarity of questions based on theories and questions; (b) exploring objective reasons; (c) presenting the most actual fact; (d) presenting an authentic and reliable source; (e) Describing/Explaining the condition thoroughly; (f) consistency and relevant to the main mind; (g) consistency with basic and trustworthy thoughts/ideas; (h) finding other alternatives; (i) free to think and open; (j) allowing for conformity based on strong evidence and opinions; (k) carefully search for trusted documents; (l) systematic and structured against something complex; (m) and sensitive to the environment (feelings), knowledge and intellectuals of others (Sutarno, 2013).

Philosophy according to Rukiyati and Andriani (2015) comes from the words "philos" and "sophia" which means "philos" contains a very deep meaning of love/affection. Whereas "sophia" means wisdom or thoughtful. In general the definition of philosophy develops within the living environment consciously or unconsciously. Popularly the word philosophy means the outlook on life (individuals) and the society. Mappasiara (2017) meanwhile, mentions the meaning of educational philosophy as a series of philosophical beliefs in educational activities (Mappasiara, 2017; Rukiyati & Andriani, 2015)

The scope of Educational Philosophy courses discusses the development of science in the field of education from various perceptions including the foundation of ontology, epistemology, and axiology. In addition, the philosophical thoughts are divided into Perenialis, Essentialism, Progressivism, Social Reconstructionism, Critical Pedagogy, Anarchism, and Existentialism. The philosophy of education also discusses the technicalities of scientific discoveries.

Several approaches or models are applied in the learning process that aims to increase the ability of learners to master learning materials. For example problem- solving model based learning, problem possing, group investigation including the inquiry model. The inquiry model is often referred as the investigation model, because it gives students the opportunity to explore knowledge through an n-depth exploration of a problem and then seek answers. According to Sutrisno (2014), the meaning of an "inquiry" is an investigation; it is the process of investigating a problem or problems through an in-depth analytical view on some issues (Sutrisno, 2014). Novak (2009) cited in Jamiels (2014) explains the inquiry is an attitude or a rational thought process to express a phenomenon based on curiosity; it is a skill of investigating to increase knowledge or experience of curiosity (Jamiels, 2014).

In addition, Syariuddin (2015) suggests that learning with the inquiry model involves an in-depth exploration that focuses on finding answers on certain problems (Syarifuddin, 2005). Roestiyah (2001) also states that the basis of inquiry learning is constructionism activities involving observation processes carried out though scientific methods. She also explained that the inquiry learning model requires active activities of learners to learn independently carried out through mental processes when formulating problems, hypothesizing, experimenting, gathering information, and drawing conclusions (Roestiyah, 2001). According to Piaget in Soemanto (2003), an inquiry is a preparatory activity of learners experimenting or observing in a wide environment to be able to observe events,

investigate and find answers accompanied by associating and comparing between the initial inventor and the next among fellow learners (Soemanto, 2003).

In general, the inquiry model is divided into three: free, guided, and modified free inquiry (Trianto, 2009). Model leads students through investigation activities on initial training. Later this model is also based on the discovery, which then enables learners to solve problems in groups of 4 or 5 people (Trianto, 2009). According to the NRC, there are 5 stages of inquiry learning model: (1) teachers give a question about objects, organisms, and events in the environment; (2) planning one of the simple practices along with the examination steps; (3) working in accordance with the measures in the practical procedure and collect data and analyze the practice; (4) using data for the right explanatory ideas; (5) submiting examinations and explanations (NRC, 2000).

In addition, Dahlan (1990) stated that the steps of the inquiry learning model include: (1) the provision of problems to direct learners to predict (guess). This stage educators/teachers conditioning problems to learners in the form of providing simple problems to motivate students to learn to think on complex problems that can provide experience for them; (2) data collection, is the process of gathering information on the phenomena it observes and they experience; (3) conducting experiments or collecting something new. At this stage, learners learn to test hypotheses or prove theories they have studied through experiments. Teachers/lecturers play an active role in the development of information to learners; (4) managing information and formulating it in the form of descriptions. Through this step, teachers /lecturers guide learners to learn to formulate explanations, decipher information that is considered difficult to explain in detail; (5) analyzing the investigation process. At this stage, learners learn to analyze how the investigation process, discovery in the form of structures or patterns that can be used as the final conclusion. Educators lead learners to learn to make notes about the advantages and disadvantages of the inquiry process and make systematic improvements (Dahlan, 1990).

Finally, inquiry learning model activities begin by directing learners to the provision of problems in the form of asking questions related to the learning materials taught (Gulo, 2002). Sanjaya (2016) explaines the advantages of the inquiry model: the change from the form of information presented to the form of information management. In addition, the learning process shifts from focusing on the teacher to focusing on the students. Teachers/educators are only mentors, while learners construct their own knowledge through self-inquiry, and then they become self-learning learners who enrich their knowledge and increase their possibility to acquire learning materials. Learners can also use learning resources from the environment as the substitution of the real teacher, making it possible for learners to remember and avoid traditional memorization or rote learning systems (Sanjaya, 2006).

In addition, for the guided inquiry model, Suparno (2007) cited in Dewi (2013) stated that the model has the advantage of being able to direct learners to the initial questioning and conduct discussion activities. Educators play an important and active role in determining the submission of questions to learners and guiding those who are less experienced in handling problems through guided inquiry stages. Through the learning of this model, the learning process will be carried out and guided by educators who master the concepts of learning materials, thus avoiding the failure of learners (Dewi, 2013).

2. Method

This study is a type of a pre-experimental research with pretest and post-test treatment of one group design. The study sample was taken in only one group, namely an experimental group of 31 students studying Educational Philosophy at Faculty of Education, Ar-Raniry State Islamic University Banda Aceh, without any comparison group. Data processing is tested with normality test techniques and t-test statistics (Al-Swelmyeen et al., 2020; Ghasemi & Zahediasl, 2012). Normality testing aims to observation whether or no distributed data is normal. Then the t-test statistic test aims to observe the influence of the application of the inquiry model for students in the study of Philosophy of Education on cognitive ability and critical thinking skills of faculty of education, Universitas Islam Negeri Ar-Raniry (Ar-Raniry State Islamic University) (Ribbins, 2005).

This method is one of the alternatives that are often used in the research of learning models in the study of educational sciences. Although there are still some other methods that can be used in extracting accurate data, in this context, the pre experimental research seems to be more feasible, since it helps teachers or lecturers to apply it as one of the methods of application of learning that can facilitate students in understanding what needed in transfer knowledge (Sugiyono, 2011).

3. Results and Discussion

3.1. Results

The results of the study explained that lecturers using guided inquiry models will improve students' cognitive abilities and critical thinking skills in the philosophy of education courses at the Faculty of education and Teacher Training, Ar-Raniry State Islamic University, Banda Aceh. The data can be observed in Table 3.1 and Table 3.2 as follows:

Table 3.1

Preliminary and Final Test Results Based on Indicators of Cognitive Ability (Higher Order Thinking) at the Philosophy of Education Lecture.

No	Cognitive Ability (Higher Order Thinking)	Pretest Value	Postest Value	*Gain*	*N-Gain*
1.	Analysis (C-4)	50,00	83,00	33	0,66
2.	Synthesis (C-5)	49,00	83,00	34	0,67
3.	Evaluation (C-6)	47,00	81,00	34	0,64
	Average	**48,67**	**82,33**	**33,67**	**0,66**

Table 3.2

Pretest and Postest Result Data Based on Student Critical Thinking Indicators on Philosophy of Education Lecture

No	Critical Thinking	Pretest Value	Postest Value	*Gain*	*N-Gain*

1.	Exploring the clarity of questions based on theories and questions; Exploring objective reasons;	50	83	33	0,66
2.	Presenting the most up-to-back; Presenting authentic and reliable sources;	49	86	37	0,73
3.	Describing/explaining the condition thoroughly; Consistency and relevan to the main mind;	50	81	31	0,62
4.	Consistency with basic and trustworthy thoughts/ideas; Find other alternatives;	49	82	33	0,65
5.	Free to think and open; Allows for conformity based on strong evidence and opinions;	51	80	29	0,59
6.	Carefully search for trusted documents;	58	81	23	0,55
7.	Systematic and structured against something complex; Sensitive to the environment (feelings), knowledge and intellectuals of others.	49	81	32	0,63
	Average	**50,86**	**82,00**	**31,14**	**0,63**

Data listed in Table 3.1 and 3.2 shows the test scores of educational philosophy lecturers with guided inquiry models can improve students' cognitive abilities and critical thinking. The average test scores on both variables increased significantly. The average students' cognitive ability for pretest and posttest was from 48.67 to 82.33. The average Gain and N-Gain values are 33.67 and 0.66 or 66%. Then for critical thinking, the average pretest and posttest value is from 50.86 to 82.00. While the average Gain and N-Gain values are 31.14 and 0.63 or 63% belong to the "medium" category. The increase in test scores of both variables explains that lectures with guided inquiry models are influential and effective on cognitive ability and critical thinking skills of students studying philosophy of education. The Normality test aims to determine the spread of data on both variables, namely cognitive ability and normally distributed or undistributed critical thinking skills. Then the next step is done t-test. The data of both tests are observed in table 3.3 and table 3.4 below:

Table 3.3: *Results of Pretest Normality Test and Postest Cognitive Ability and Critical Thinking Skills of Students*

No	Variable	Test	Normality Test			Description
			Average	Sd	Significant level	
1.	Cognitive	Pretest	39,26	13,96	0,16	Normal
	Ability	Postest	78,23	13,84	0,14	Normal
2.	Critical	Pretest	41,15	9,69	0,12	Nornal
	Thinking	Postest	80,51	10,23	0,16	Normal
			$L_{(table)}$, α = 0,05		0,16	**Normally Distributed**

Table 3.4: *Results of Student Cognitive Ability and Crtical Thinking T-test Skills*

No	Variable	Value t (calculate)	Value t (table)	Dicision
1.	Cognitive	14,34	1,70	"H_a" Accepted
2.	Critical Thinking	20,26	1,70	"H_a" Accepted

Statistics t-test results also corroborate that, the guided inquiry model can improve students' ability to master the material philosophy of education. Statistical comparisons of pretest and postest marks experienced significant differences. T-test value for cognitive ability $t_{(calculate)}$ of 14.34 and critical thinking of 20.26 with α = 0.05 or significance of 95%. While the $t_{(table)}$ value of both variables is cognitive ability and critical thinking = 1.70. This shows that lectures guided inquiry model is very effective, appropriate or appropriately applied to the course philosophy of education. The t-test curve can be observed as follows:

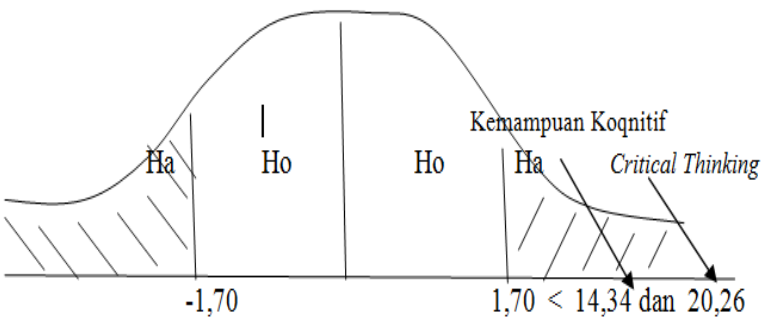

Figure 3.1. T-test Results of Cognitive Ability and Critical Thinking Skills of Students.

Lectures with guided inquiry models have influenced students on cognitive ability and critical thinking skills on the material Philosophy of Education. Guided inquiry learning steps are able to improve students' cognitive abilities, namely in the mastery of concepts, including the ability to analyze (C-4), synthesize (C-5), and evaluate (C-6). This ability is also called ability at the high order thinking level. Then the inquiry model also improves student' ability on every critical thinking indicator. This is seen in Tables 3.1 and 3.2 concerning the N-Gain average of both variables.

1.1. Discussion.

The finding suggests that exposing students with critical questions and seek the reasoning of a phenomenon will boost students' analytical thinking (C-4). This is so since students are encouraged to elaborate their answers. The Inquiry based-learning model allow students to gain the analytical thinking level, since student analytically respond to a certain inquiry through a deep thinking and go beyond mere description.

In addition, students also learn to improve their critical thinking, such as giving a simple explanation (elementary clarification) and accurately respond to questions (problems posed by lecturers clearly by giving logical opinions related to theory (Ni Putu, 2016; Rauscher & Badenhorst, 2020). Then find a strong reason for the question of such phenomenon. In the field of philosophy of education for example about the concepts of logic, freedom, adjustment, growth, experience, needs, and knowledge (Cabezudo et al., 2012). The activity of analyzing is by describing or explaining a study with other studies, or determining a concept with other concepts will make students skillful in classifying when handling problems in the classroom (Pedaste et al., 2015). To improve the ability of students, it can be trained through metaphysical or ontology foundations. Rukiyati, et al (2015) stated that the foundation of ontology is one of the important foundations in the philosophy of education in addition to requiring epistemological foundations and the basis of the phenomenon (Joko, 2014; Riveros & Newton, 2016).

The next step is data collection, learners gather information about the events they observe, and they experience at the stage of presenting the problem. These steps equip students with concept mastery skills in the realm of analyzing (C-4), synthesizing (C-5) evaluating (C-6) and have motivated students to learn to choose the data and information needed for problem-solving. The data are then analyzed and studied (C-4) and then think and explore the suitability of information with every actual fact (C-5). For example, the activity of sorting out some phenomena that occur based on concepts, classifying, and then categorizing those concepts. Furthermore, review and compare the concepts that have been compiled to fit the phenomenon that occurred. In other parts, these treatments also train critical thinking skills and provide student experience to solve problems that actual occur. For example, critical thinking skills are trying to be the most actual and using reliable sources when reflecting various phenomena that exist from various perspectives related to the concept philosophy of education. Through reliable sources, students learn to clarify further (advance clarification) about these phenomena.

In addition, the exercises used in explaining the answer develop the ability to synthesize (C-5) evaluate (C-6) and lead to students' critical thinking skills of students. This activity trains students to clarify further (advance clarification) or explain the whole situation and try to stay relevant to the main idea. Then motivate skilled students to keep basic and original ideas in their minds and look for other alternatives to problem-solving learning. For example, students' ability to translate empirical numbers metaphysically in the form of sentences broadly and in-depth, provide information from the submission of problems in the lecture process. How to translate empirical data (in the form of numbers) about the value /score of the test or data on the number of poverty of the population.

Analyze, synthesize (C-4) and evaluate (C-6) the data to explain and interpret phenomena with various perceptions. Gutek (1988:2) in Rukiyati, et al (2015) explained the metaphysical related to formulating theory and field activities in the form of skills in all aspects (Rukiyati and Purwastuti, 2015). Students' ability to interpret and explain empirical data information according to their language from various aspects, will increase confidence and courage discussion during lectures can make the

learning process active. This activity can improve students' critical thinking, namely on the ability to open-minded explain the evidence that corroborates the reasons for solving problems.

Furthermore, the step also trains the critical thinking ability of students to think logically with evidence of accurate support to the phenomenon experienced. They also agree with systematically and complexly assessing and appreciating the feelings, knowledge, and intelligence of others when discussing or studying existing concepts. This activity will make it easier for them to evaluate, decide and implement and the ability to manage strategies to solve learning problems in the philosophy of education.

The results of the t-test also showed that lectures with an effective guided inquiry model were able to improve cognitive abilities and critical thinking skills of students studying Philosophy of Education courses. Overall, each indicator of cognitive ability and critical thinking ability increased by an N-Gain of 0.66 for cognitive ability and 0.63 for critical thinking skills. Both indicators fall into the "medium" category.

4. Conclusion and Recommendation

Based on the description of the article above, it can be concluded that there are two important things that can be used as a strategy that can make an inquiry learning model on the philosophy of education material on student's cognitive and critical thinking ability, among others: *first*, lecturers using guided inquiry models are able to improve cognitive ability and critical thinking skills in the philosophy of education courses. *Second*, The average N-Gain scores of both indicators increased by N-Gain 0.66 for cognitive ability and 0.63 for critical thinking skills, fall into the "moderate" category. As the findings of field data in this manuscript, I recommend lecturers and teachers to approach the learning model in schools using the inquiry model learning, so that students and college students are able to improve cognitive abilities and critical thinking skills in the philosophy of education courses, especially for higher education. While in high school on special subjects the inquiry learning model can support and improve critical thinking for students.

References

Al-Swelmyeen, M. B., Sakarneh, M. A., & Al zabenc, G. P. (2020). The effect of self- questioning strategy in developing independent thinking in teaching physics. *Cypriot Journal of Educational Sciences*, 15(3), 502–510. https://doi.org/10.18844/cjes.v15i3.4918

Alec, F. (2009). *Berpikir kritis: sebuah pengantar*. Erlangga.

Cabezudo, A., Christidis, C., Carvalho de Silva, M., Demetriadou-Saltet, V., Halbartschlager, F., & Mihai, G.-P. (2012). Global Education Guidelines: A Handbook for Educators to Understand and Implement Global Education. *The North-South Centre of the Council of Europe*. https://app.lms.unimelb.edu.au/bbcswebdav/pid-4138663-dt-content-rid-13157929_2/courses/EDUC90727_2014_SM2/GEguidelines-web.pdf?target=blank

Depdiknas. (2003). Undang-undang RI No.20 tahun 2003. Tentang Sistem Pendidikan Nasional.

Dewi Narni Lestari, Dantes Nyoman, S. W. (2013). Pengaruh model pembelajaran inkuiri terbimbing terhadap sikap ilmiah dan hasil belajar IPA. *Jurnal Program Pascasarjana Universitas Pendidikan Ganesha Jurusan Pendidikan Dasar*, 3, 3.

Dimyati Dan Mudjiono. (2011). *Model pembelajaran inovatif*. Media Persada.

Eric, J. (2011). *Pembelajaran Berbasis-Otak: Paradigma Pengajaran Baru*. PT Indeks.

Ghasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: A guide for non- statisticians. *International Journal of Endocrinology and Metabolism*, 10(2), 486–489. https://doi.org/10.5812/ijem.3505

Gulo, W. (2002). *Strategi belajar mengajar*. PT Grasindo.

Jamiels. (2014). *Inquiry strategy* (p. 135). SMPN1 Bantul. http:www.smpn1Bantul.net

Joko, S. (2014). *Pengaruh strategi pembelajaraninquiry dalam belajar sains terhadap motivasi bBelajar pserta didi*k.

Kuswana and Sunaryo Wowo. (2011). *Taksonom berpikir*. Remaja Rosda karya.

M. Dahlan. (1990). *Model-model mengajar*. CV Dipenogoro.

Mappasiara. (2017). *Filsafat pendidikan islam. Inspiratif pendidikan*, 6(2), 269. https://doi.org/10.24252/ip.v6i2.5231

Ni Putu, A. N. A. (2016). Teacher's way to foster critical thinking in the classroom (A Case Study of a Senior High School in Bandung). *Journal of English and Education*, 4(1), 51–72.

NRC. (2000). *National science education standards*. National Academy Press.

Pedaste, M., Mäeots, M., Siiman, L. A., de Jong, T., van Riesen, S. A. N., Kamp, E. T., Manoli, C. C., Zacharia, Z. C., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. *Educational Research Review*, 14, 47–61. https://doi.org/10.1016/j.edurev.2015.02.003

Rauscher, W., & Badenhorst, H. (2020). Thinking critically about critical thinking dispositions in technology education. *International Journal of Technology and Design Education.* https://doi.org/10.1007/s10798-020-09564-3

Ribbins, P. (2005). Greenfield on educational administration. In *Greenfield on educational administration*. Routledge. https://doi.org/10.4324/9780203973561

Riveros, A., & Newton, P. (2016). Ontological issues in educational administration: *The Ontological Status of Educational Organizations*. In Encyclopedia of Educational Philosophy and Theory (pp. 1–5). Springer Singapore. https://doi.org/10.1007/978-981-287-532-7_284-1

Roestiyah N.K. (2001). *Strategi belajar mengajar*. Jakarta: Rineka Cipta.

Rukiyati dan Andriani, P. (2015). *Mengenal filsafat pendidikan. Universitas negeri yogyakarta*: Fakultas Ilmu Keguruan.

Setiawan Ibnu. (2011). *Menjadikan kegiatan belajar mengajar mengasyikan dan bermakna, Terjemahan dari Johson* (2006). Mizan Learning Center.

Slameto. (2003). *Belajar dan faktor-faktor yang mempengaruhinya.* Rineka Cipta.

Sugiyono. (2011). *Metode penelitian pendidikan pendekatan kuantitatif, kualitatif, dan R&D. Alfabeta.*

Sujana Nana and Rifai Ahmad. (2017). *Media pengajaran*. Sinar Baru Algensindo.

Sutarno. (2013). Pengaruh penerapan praktikum virtual berbasis problem solving terhadap kemampuan berpikir kritis mahasiswa. *Prosiding Semirata* FMIPA.

Syarifuddin. (2005). *Menejemen pembelajaran*. Quantum Teaching.

Trianto. (2009). *Mendesains model pembelajaran inovatif- Progresif konsep landasan dan implementasinya pada kurikulum Tingkat Satuan Pendidikan* (KTSP). Kencana.

Wasty, S. (2003). *Psikologi pendidikan*. Renika Cipta.

Wina, S. (2006). *Strategi pembelajaran berorientasi standar proses pendidikan*. Kencana Prena Media Group.