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Learning Model for the Enhancement of Students' Potentials in Logical Thinking

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Abstract : This paper entitled "Learning Model for the Enhancement of Students' Potentials in Logical Thinking" presents a report of a research project concerning Avecinna thoughts on educational reasoning. This study is seeking to find an educational model that can enhance students' reasoning potentials.To serve the purpose an experiment had been set up in Indonesia University of Education, in which the first year students served to be the subjects of the study. Besides this quantitative design, qualitative research procedures had also been done to collect complementary data required to assess the appropriateness of the model resulted. The logics experimented in this research was developed on the bases of Kitab Al Mantiq As-Sinawi. The data were collected through test of reasoning, learning process evaluation, and document analsysis. The results of the analysis shows that there is a significant difference in reasoning level between students using the experimented educational model and those using the existing educational model. It is also showed that the logics of Avecinna (1) may serve as "the key" to the understanding of several disciplines, (2) The research also shows that The Avecinna model includes thinking and debating, pairing and sharing; and that the lecturer involved has the following characteristics: capable, planner, motivator, developer, and innovator.In conclusion, the research has been successful in developing an educational model based on the logics of Avecinna which may be used for the enhancement of students' potentials in logical thinking and sound reasoning.

Keywords : Learning Model, Students 'Potential, and Logical Thinking.

1. INTRODUCTION

Intellectual activities of FPIPS UPI students arestill low. Of 70 questions theintellectualtest provided, only 50% are true in terms of 72 students attendingan examination in class of 2013 and 4 graduates in class of 2010attending graduation ceremony in April 2014.

Based on the fact, the question is what efforts can do to increase the capacity to logical think and reasoning of students in FPIPS UPI setting? To answer this question, we require a learning strategy emphasizingstudents'capacitiesto think. As Joyce and Weil (1980: 38) put it, "There should be Cognitive Growth learning: Increasing the capacity to think. In their learningsystem, the educators utilize the experience of students as a starting point to think.

This study was designed to obtain data on the correlation of elements of learning and teaching process in terms of Ibnu Sina logic material in increasingstudents' understanding and reasoningin FPIPS UPI. As a method, the logic was created to examine the accuracy of the reasoningwhich is used to preventintellectfrom wrong thinking (Shaliba, 1973: 428). Aristotle said that logic he calledanalytical study is the study of thinking distinguishingways of right and wrong thinking. Every knowledgeneed for logic (Kamal, 1995: 123).

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One Muslim philosopher who, among others, have a strong interest in logic was Abu Ali Husain Ibnu ‘Abdillah Ibnu Sina, or known as Syaikh Al-Rais Abu Sina (Bakry, 1984: 43). In Western countries,he is better known as Avicenna (Nasution, 1995: 34). In Indonesia, particularly Islamic schools and Islamic Universities, the logic is the subject matter (Nurcholis, 1984: 39). In UPI, a new logic material was given in the Faculty of Mathematics and Natural Sciences Education (FPMIPA).

The public education is based on individual development in terms of learner intellectual, emotional, social and moral. There is a basic agreement on a number of objectives setby a specialist of General Education (Henry, 1952: 73) who summed up them into five basic objectives:to develop critical intelligence that can be used in many areas of life, to develop and to improve the moral character, to develop and to improve the citizenship, to create intellectual unity and harmony of thought, and to provide equal opportunities as much as possiblethrough education forindividual economic and social improvement.

The author would like to examineIbnu Sina logic learning design for students of FPIPS UPI in an effort to increase the capacity to logically thinkand right reasoningfor students constituting the realization of basic General Education goals; that are,developing critical intelligence, creating intellectual unity and harmony of thought.

Based on the rational reasons, this research was designed to study Ibnu Sina logic material and its learning model in an effort to increase the capacitytologically think and reasoning of UPI FPIPS students so they have the provisions to facilitate their understanding of the other discipline-based subjects. Based on the background mentioned above,the problems can be formulated in a general way:what logic learning model could beincreasing the capacity of FPIPS UPI students in logical thinking and right reasoning?

Theresults of the research areanticipated to contribute academic knowledge and, therefore, input to the world of education, particularly FPIPS UPI and other non-exact faculties. In addition to delivery contribution to the world of education, the research is conducted as response to any gap between FPIPS and FPMIPA student capacities of reasoning.

Practically, this research can provide an alternative guidance to direct the curriculum and each course learning model, more specifically,moral value education.

For the next researchers, this study can be used as inspiration for the discovery ofworld-class Muslim philosophers works, some of them today were forgotten by the most of Muslims themselves.

2. RESEARCH METHOD

The method used in this study is quasi-experimentalpreceded byphenomenological and hermeneutical. Hermeneutics is a philosophical method seeking to understand text or philosophical text through interpretation (Noerhadi, 1996: 35). In this case,it is meantIbnu Sina logic text. While phenomenology isdesigned to release the course of thought from what is considered ideal, but not basedonthe reality. Prominent IbnuSina’s thoughtsto be reference of the research are:

- *Ash-Shifa*, a book consisting of 10 volumes containing logic, mathematics, physics and metaphysics.
- *An-Najah*, a bookconstituting summary of *Ash-Shifa*.
- *A1-Iyarat Wa Al-Tanbihat*, a philosophical book containing aphorisms of various professional thinkers written in a solid and beautiful language.

The data were collected by observations, interviews, documentation studies, and tests. The instrument used in the research are of two types: the main instrument is human (researchers itself) and the collection of material data in the form of questionnaires and test sheets.

Location and Subject of Research

This research was conducted in the Faculty of Social Sciences Education of Indonesian University of Education (UPI).

The reasons for the selection of study site are: (1) One of UPI missions is to organize educationin order to prepare professional educators and other professionals with global competitiveness. To be able to compete with the other professionals, it isnecessary to have, as one requirement, high capacity of reasoning, (2) Vision of FPIPS UPI is to be aleading educational institution. One of its missions is to improve the quality of learningin social studies education and social sciences to strengthen the quality of professional graduate. To improve the quality of learning, thestudents (the participants) are required to have, as one requirement, high capacity of reasoning, (3) The opinion that students in the social studies setting have low capacity of reasoning, making it difficult to encourage them to develop themselves.

The subject of this researchare the first sophomore at even semester of 2013 Islamic Religion of Education study program. The selection is made at random, as each member of the population have an equal opportunity to be sample.

Picture of Intellectual Activity (Capacity of Reasoning)

Test of logical thinking (TOLT)prepared and adopted bythe logical reasoning test (Lawson, 1978; Lawson, Adi and Karplus, 1979), was awarded to students with a demonstration appropriate to individual test items. In the latest development, the TOLT is presented in the form of multiple choices.

Based on the study of the subjects ranging from high schools to colleges, wefound a valid, studyinstrument to measure formal capacity of reasoning. The studies confirms that the TOLT is actually measuring formal reasoning and constituting a test group appropriate to beput in the test about many subjectsat the same time.

Reasoning is thehuman ability to follow a certain plot in understanding and developing knowledge. Reasoning is the process of thinking in drawing a conclusion in the form of knowledge (Suriasumantri, 1984). The process of reasoning requires logic, while the logic is related to the drawing of conclusion oriented to the formulation of a new knowledge in itself (Huffman et al, 1997).

There are three aspects of intelligence in the capacity of reasoning included in the intelligence area. They are:(1) Componential Intelligence, the capacity to critically, analytically, consistently think to support the decision-making on complex cases, (2) Experiential Intelligence, the capacity to collect similar information, but which are not interconnected together to generate new ideas. This capacity is closely related to the aspect of creativity, (3) Contextual Intelligence, the capacity of practical intelligence which when it is deeply owned by the concerned can help to summarize the description of a situation and then to adapt it (Greenberg & Baron, 1997). There are seven characteristics to describe a person's intellectual activity, they are:

- Verbal Comprehension, the capacity tounderstandthe contexts ofword, vocabulary, sentence, and mastery of oral communication.
- Word Fluency, the capacity to digest certain words or phrases in exact manner.
- Numerical Fluency, the accurate, speedy use of the basic arithmetic functions.
- Spatial Visualization, the capacity to recognize various types of visual contexts.
- Associative Memory, the capacity to remember pictures, messages, numbers, words, sentences, and types of patterns.
- Perceptual Speed, the capacity to perceive something quickly, and
- Reasoning, the capacity to take the conclusions from various examples, rules or principles. It can also be defined as the capacity to solve problems (Huffman, et al, 1997).

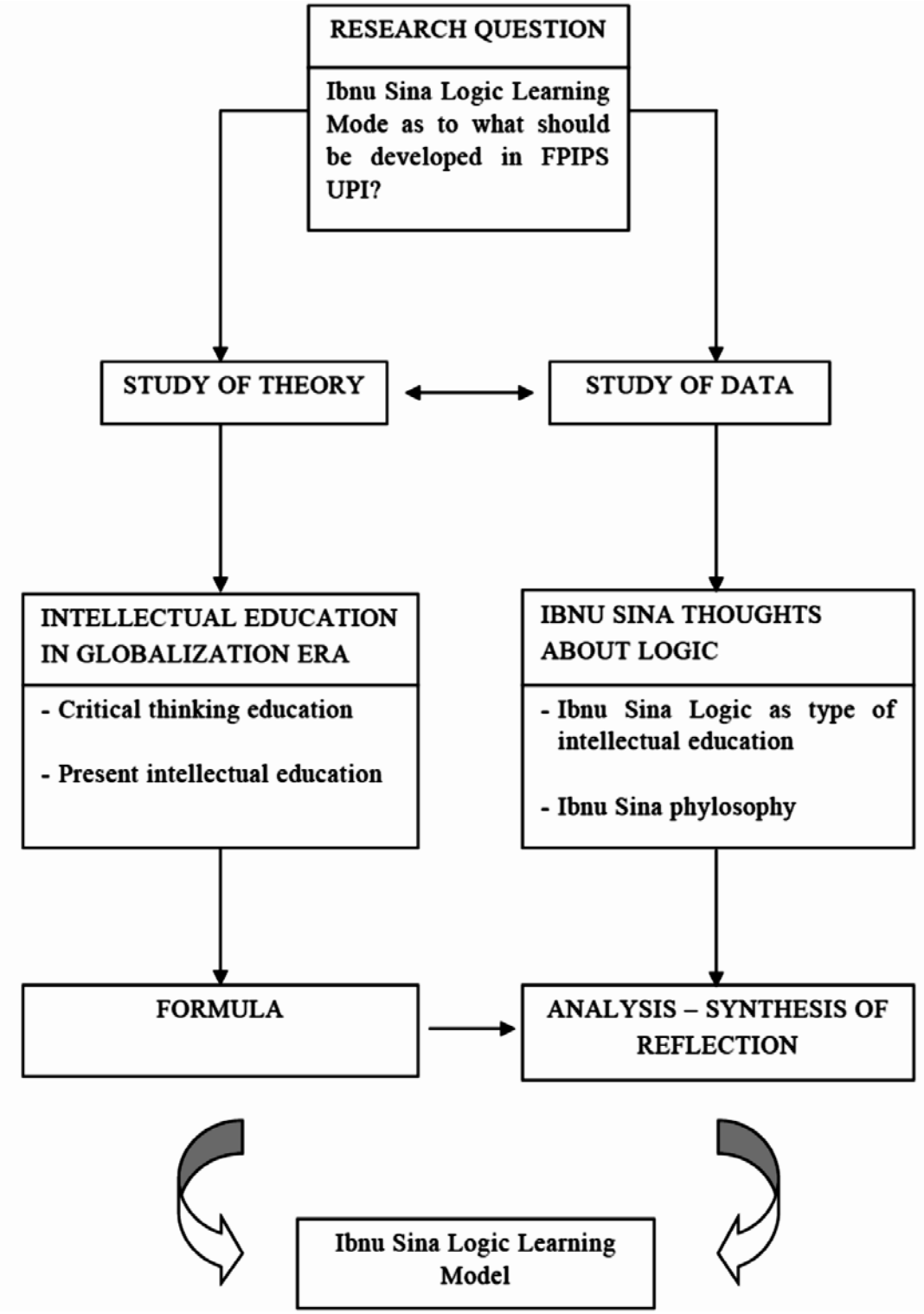
Learners with high reasoning are more active, theyhad have rational and intuitive appreciations (Michener, 1978) and, therefore,functional knowledge (Pollatsek, Lima and Well, 1981). Contrarily, learners with low reasoning have their passive characteristics and just reaching mechanicalappreciation or jut reaching at knowing how to (Copeland, 1979: 49).

Think or reason logicallyis evoking someone have to move beyond information he heard. Suppose a person's capacity to think or reason to find a new solution to the problem facing him.

Research Framework

This research isfollowing in the thinking plot of research as illustrated below :

Thinking Plot



Research Paradigm

Figure 1

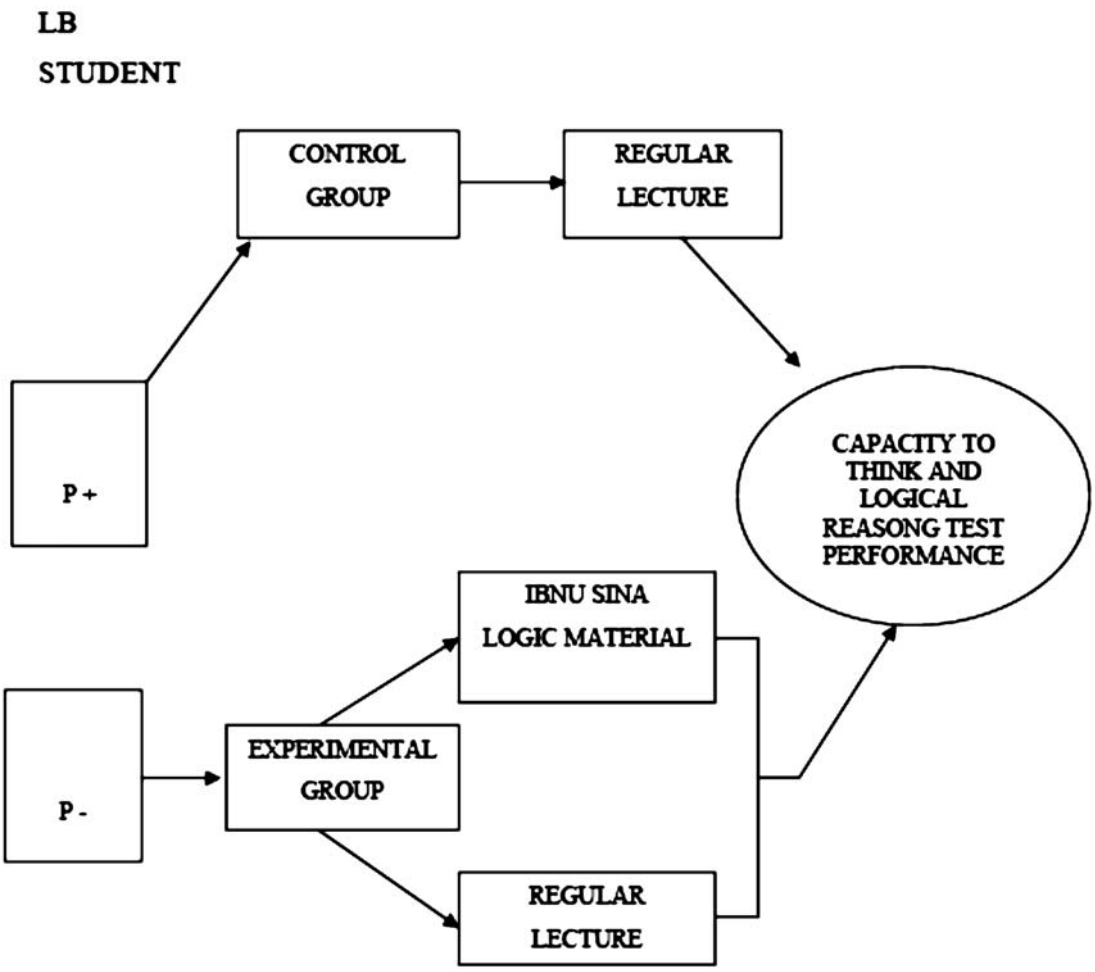


Figure 2

Research Findings

There are some terms in Ibnu Sina logic as follows:

- Pronounciation
- Universal
- Partial
- Essence and accident
- Species, genus, differentia, common accidents, and proper accidents
- Analytical definition and descriptive definition
- Ten categories: substance, quantity, quality, relation, place, time, situation (position), ownership, action or deed, and will or passive
- Proposition, categorical proposition, conditional proposition, hypothetical conditional proposition, disjunctive conditional proposition, singular proposition, determinative proposition, indeterminative proposition, universal determinative proposition, particular determinative proposition, universal affirmative and negative propositions, modified proposition
- Contradiction
- Conversion
- Contraposition

In addition to types of thinking studied in Ibnu Sina logica, the reasoning is discussed in terms of content or principles of conformity between mind and reality is studied.

Table 1
Statistical analysis of the reasoning test scores

Level I	*2013Islamic ReligionEducational Study Program*	*Score T*
Sample Size	72	
Lowest Score	23	28
Highest Score	53	70
Average Score	38.8	50
Average Score in Percent	55.4	71
Standard Deviation	7.126	10

Table 2
Statistical analysis of the reasoning test scores by class

Class	*Control*	*Experiment*
Sample Size	36	36
Lowest Score	23	24
Highest Score	53	44
Average Score	38	34
Average Score in Percent	54	63
Standard Deviation	7.13	10

Table 3
The results of the analysis of the reasoning level

Class	*n*	*X*	*J*	t_{hit}	t_{table}
Control	32	3.86	3.61	38.5	3.77
Experiment	33	7.64	2.82		

$t_{hit} > t_{table}$, so null hypothesis (Ho : $P_{xy} = 0$) is rejected at significance level $\alpha = 5$ %. Therefore, the research hypothesis (H_1) is accepted, so it can be concluded that students inexperimental class have superior reasoningtothose incontrol class.

Based on the results of a questionnaire distributed to students in experimental class and analyses of learning for other subjects, we obtain findings:

- IbnuSina logic will have to be included in curriculum as a subject for faculty of FPIPS UPI.
- The learning model to be used is debating, think, pair, and sharing.
- Instructorswho reasonableto provideIbnu Sina logic materialsarethey havingcharacteristics of capable personal, developer, motivator, innovator, and planner.
- Evaluation modelto be given is question containing logic for measuring student capacity of reasoning or similar academic potential test or psycho-test.
- Ibnu Sina logic materialsto be provided for FPIPS UPI students are consisting of nine sections: introduction, categoryten, proposition, syllogism, demonstration, dialectic, rhetoric, poetic, and sophistic.
- Picture of ideal reality for students who have studied logic Ibnmu Sina logic are those who do not have difficulty in attending the course of other disciplines and gain better academic achievement than those who do not receive Ibnu Sina logic learning.

3. CONCLUSION

For the majors in FPIPS and faculties in non-exact UPI, it is discreetto incorporateIbnu Sina logic material as one of subjects to be followed by freshmen, allowing them to increase their capacities of reasoning,thereby making them easier to study a variety of other disciplines. Further more specific, focused research of educational philosophy is necessary in Indonesia, particularly UPI, based on the idea of IbnuSina philosophy, mainly on his logic.

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