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DEVELOPMENT OF LEARNING INSTRUMENT OF OPPORTUNITIES THEORY USING PROBLEM BASED INSTRUCTION (PBI) MODEL FOR STUDENTS OF MATHEMATICS EDUCATION PROGRAM EDUCATION AND TEACHERS' TRAINING FACULTY, UIN SULTAN SYARIF KASIM RIAU

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Abstract

This study was aimed to develop the learning instruments of opportunities theory using valid PBI model, practical and effective for students majoring in Mathematics Education and Education and Teachers' Training Faculty UIN Suska Riau. This research method is using the approach of Development Research with 4D development models (Define, Design, Development and Dissemination). The study consisted of four phases: analysis of student needs, preparing conceptual framework and the model of learning, validation of experts / practitioners, test development, and promote the development of products.

Based on preliminary diagnosis, then it was designed learning that included SAP (Learning Syllabus) and Worksheet (LK) were then consulted with experts. Subsequently these were validated by 5 (five) experts consisting of three (3) instructional design experts and 2 (two) experts in articles / content from UIN Suska Riau (56 for RPP and 56,8 for LKM in categorizing good). (2) learning tools can be used by students and lecturers without significant obstacles, in practical use by observer ratings and student as well as lecturers, and (3) learning tools has shown effective from the learning activities, motivation, and student learning achievement which were higher after participating in learning. In this research, it had been found learning instruments of mathematics based on PBI at Opportunity Theory. To get a real good and/or to make perfect learning instruments which has been developed, it was needed to do this learning instrument testing in other class and university having the same characteristic to experiment class.

Keywords: *Learning devices, Opportunity theory, PBI, Learning Activities, Learning Achievement.*

INTRODUCTION

Background

The Opportunity theory is very important lesson to teach to the students of Mathematics, since in daily activities many students are associated with the opportunity of an event for example : in weather forecasts, opportunities to diagnose a disease and others. Opportunity theory would seem easy to learn if it is associated with real world situations. Giving mathematical problems related to everyday life in the Theory of Opportunity will help students understand more easily. Therefore,

teachers need to design a learning device that can support the learning process with the opportunity theory directly links with the day-to-day activities.

When a lecturer only focus to teach learning textbooks, the student motivation reduce, and they are easily bored which impacted to learning activities and student learning activities. Therefore, the lecturer shall design students to more actively involve in learning.

One of learning model that presents a real-world problem in supporting student learning and lecturers to be more active is the model of *Problem Based Instruction (PBI)*. This learning model was selected because in general that problem-based learning consist of presenting authentic problem situations and meaningful learning that can provide convenience to them to conduct an investigation and inquiry. According to Dewey (in Sudjana 2001) problem-based learning is stimulus and response interaction, a two-way relationship between learning and the environment (p. 19). Environment provide feedback to students in the form of aid and problems, while the nervous system is functioning brain that help interpret effectively so that problems encountered can be investigated, assessed, analyzed and sought to solve well. Students experience gained from the environment will make him materials and materials in order to gain understanding and can be used as guidelines and learning goals.

The practical steps that must be done by the lecturers are student orientation on issues, to organize the students to learn, willing to guide the investigation of individual and groups, develop and present work, evaluate and evaluate the problem-solving process.

Therefore, it is developed a learning device (SAP and LK)-based Model of *Problem Based Instruction (PBI)*.

Characteristic Problem Based Instruction (PBI)

Problem-Based Instruction(PBI) is a learning model requiring investigation of authentic investigation that need the real solving of the real problems. Lambas dkk (2004: 23-27) arises that PBI is study using real world problems as context for student to learn critical thinking and skillful to solve problem, and get knowledge and base concepts.

Arends (2006) added that PBI is a study model where student does authentic problems with a view to compile their own knowledge, develop inquiry and high thinking skills, develop independence and self confidence. Usage of this PBI according to Pannen dkk (2001: 87) laid clearly that PBI was applied in study with an objective to involve student, push student to take charge of at their education. Its stress is at critical thinking skills, understanding, lesson how to learn. Hereinafter Pannen also expressed that at PBI information source is identified, collected, evaluated and exploited by students themselves, do not be provided by teacher. Hereinafter Ronnis (2001) arised that PBI claims student to identify what they know, so that they must look for relevant concepts to answer problems (p. 12).

Delva (2006) explained that PBI pushes autodidact learning and gives students the practices to handle situation to bewilder and defines their own gap in comprehending relevant problems, on the chance of making student can remember more matter. PBI is a way to motivate an understanding that is deeper to matter, so this can make

student love to learn and and can measure their own trust. As which expressed by Woods (1989) which was cited by Lufri that, way of developing skill of student trouble-shooting is: to make them love to learn; to make their best learning; directional self learning to develop group skill; to have an interview with student after completing study; and develop and measure self trust.

Study of PBI is always started with existence of problem which must be finalized by student through experiment or observation. According To Rightful (2002) trouble-shooting learning basically is learning to apply scientific methods or thinks systematically, logical, regular and accurate as a mean to obtain cognitive ability and efficiency to solve problem rationally, bare and duty (p. 123).

PBI tries to form student to become self learner. The repeated tuition of teacher pushes and points student to submit question in looking for solution to problem given by the teacher. Thereby, student learns to finalize their own duties. To solve problem can be viewed as a process where student try to find combination of orders which has been studied in advance that is applied in solving new problems. However, to solve problem does not only apply known orders, but also create new lesson. Signs or characteristic of PBI according to Ibrahim and Nur (2008) :

1. Certain question offering or problem. PBI does not merely organize certain principle or academic skill, however to organize teaching around question and problem which both social and personal have important meaning for student.
2. Focus at interdisciplinary interrelationship. Though PBI may be possible centralistic in certain subject (Sciences, Mathematics, Social science), the problem which will be investigated has been selected which is really real in expectation of resolving, the student evaluates the problem from many subjects
3. Authentic Investigation. PBI obliges the students to do authentic investigation to look for solution to real problem. They must analyse information, do experiment if it is required, make inference and to formulate conclusion. Research method depend on problem is being studied.
4. To yield work product and demonstrate it. PBI claims student to yield certain product in the form of explaining artifact reality masterpiece and demonstration or represents the solving of problem which they find, and the product can be in the form of debit transkip, to make report, model, video or computer program. PBI was distinguished by student to cooperate one another or very often in couple or small group. To cooperate gives motivation on an ongoing basis involves in complex duties and to develop social and thinking skills.

Learning Instruments of PBI

Learning instrument is essential part in execution of study in educational institution. Through good learning instrument it is expected that student become more active and lecturer stands as facilitator. Learning tools covered in this research is Learning Unit Syllabus (SAP) and Student Spread Sheet (LKM) compiled to be reference material for all the interested parties by developing learning instruments, like lecturer, student and also other education adviser. For headmaster, this module can be made construction material for teacher to find the difficulties in developing LKM.

The development of LKM for lecturer will give two advantages, firstly they will have LKM which can assist in execution of activity of lecturing, and second is that LKM can be submitted as masterpiece assessed to add lecturer point credit number. For

student will be able to make easy comprehend matter because it is equipped with breakdown of matter, example of problems and guiding to solve the problem. Through learning instruments of PBI this will be given skills of how seeing problem related to reality life.

Research Question

In line with problem focus and limitation of researcher, hence the researcher limited at the problem of how development of SAP (Learning Unit Syllabus) and Spread sheet (LK) based on PBI which can facilitate students' learning in Mathematics Education FTK UIN Suska Riau as follows :

1. How validity of SAP and LK based on PBI?
2. How practicality of SAP and LK based on PBI?

Purpose Of Research

Purpose of this expansion is to yield learning instruments based on PBI which can facilitate students' learning in Mathematics Education in FTK UIN Suska Riau. As for purpose of special of this research is: To know how validity, practicality, and description of effectivity of SAP and LK in Mathematics Education program FTK UIN Suska Riau.

Research Method

Expansion models 4-D (Four D model) was learning instrument expansion models. This model was developed by S. Thiagarajan, Dorothy S. Semmel, and Melvyn I Semmel. Expansion models 4-D consisted of 4 main phase that is : (1) Define (Definition), (2) Design (Scheme), (3) Develop (Expansion), and (4) Disseminate (Spreading) or adaptation by Model 4-P, that is Defining, Modelling, Expansion, and Dissemination. In this research only limited come up with phase develop because using modification from model 4-D.

Development of Learning Instruments of model 4-D in this research is presented like at the following diagram.

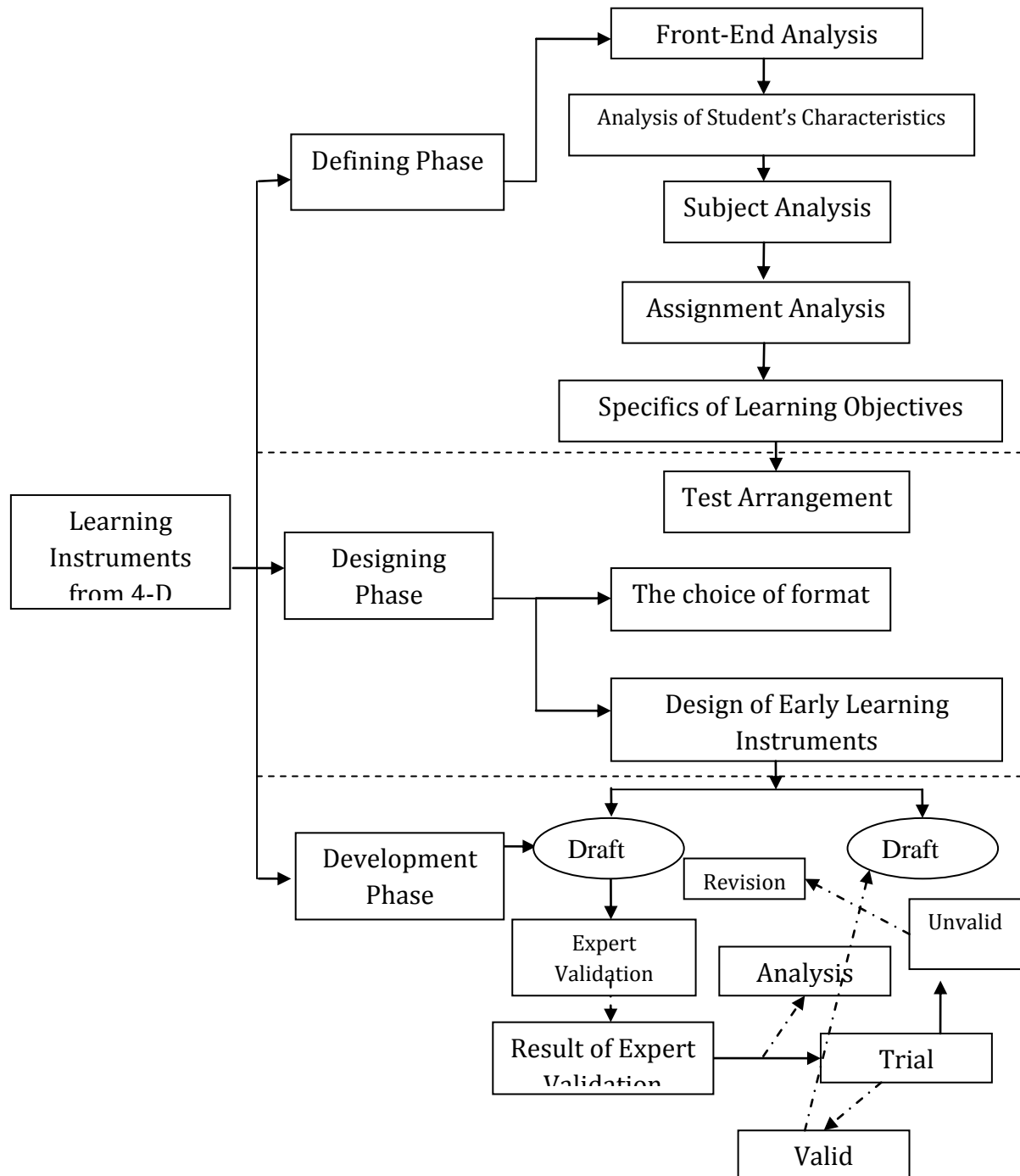


Diagram 1. Development of Learning Instruments of model 4-D

THE RESULT OF RESEARCH

Definition Phase

a. Front-End Analysis

Activity of this front-end was done to determine elementary problem in expansion of lesson material. This phase was done by presentation of study and situation of study enabling educative participant like to learn, the learning theory relevant and future demand, causing was obtained description of compatible study pattern. Based on

front-end analysis, the researcher interests to develop study instruments of study model mathematics PBI.

b. Students' Analysis

Student's Analysis was analyzed about students' characteristic as image of planning and expansion of learning instruments. This characteristic covers reasoning of knowledge and level of cognitive development of students. Instruments developed will be done trial test at 4th semester students of Mathematics Education.

c. Matter Analysis

At this phase analysis done is analysing topic because studied in mathematics is not merely concept but covering fact, concept, and principle. Matter analysis aim to identify, itemizes and compiles systematically relevant matter which will be taught based on analysis awal-akhir. From result of researcher discussion with course lecturer, matter which was difficult comprehended was Theory of Opportunity.

d. Assignment Analysis

From matter analysis of Opportunity Theory was upper able to be formulated workable duties by students that is studying understanding of matematik hope, rataan random variable, variance and covariance, mean and in finalizing problem related to everyday life.

e. Specification Of Purpose Of Study

Based on matter analysis and assignment analysis at TP matter, it can be formulated the purpose of study of this matter. In determining purpose of study it must be paid attention on the curriculum used as reference.

Scheme Phase

This phase to design study peripheral, causing is obtained prototype (example) study peripheral. Example of study peripheral planning yielded is (1) Set Of Lecture's time table, (2) Spread sheet.

Development Stage

Result Of Assessment Of The Experts

No	Instrument	Validator					Average	Score
		1	2	3	4	5		
1	SAP	57	57	56	54	56	56	Good
2	LKS (Worksheet)	59	58	57	53	57	56,8	Good

Table 1. Result Of Validation Validator to SAP and LK

Learning outcomes achieved by students achieve mastery average of 77.59 with the provisions of KKM = 65. Liveliness and process skills to the learning achievement of students and will result in students having active and skilled in the learning process.

DISCUSSION

Result of interview with lecturer and students indicated that students's understanding with execution of study with model PBI and admission filling of

Spread sheet also assisted them in comprehending lecturing matter. According to the students problems of the LK varies, there is problem which is easy and difficult. As a result, all problems can't be finalized. The time required to fill different spread sheet and depends on condition of learning at that time.

Learning instruments developed had passed validation process which has been specified some experts which expert in their field. Validation average yield was obtained averagely 56 for learning intruments. Learning instruments developed by bosa applied by lecturer and students without meaningful constraint.

So according to results and discussion of the research above, learning instruments of Mathematics based on PBI on Opportunity Theory was valid and effective, therefore development of learning instruments can be achieved.

CONCLUSION

Summary

1. By using modification of expansion models 4-D (Four D model). Because study peripheral developed has passed validation process specified by man who experts with the field with average value 56, hence study peripheral bases on PBI developed in this valid research.
2. Study peripheral can be applied by students and lecturer without meaning constraint, in practical meaning its use according to assessment of observer and students and lecturer
3. Trial test result of learning instrument and execution of study indicated that the learning instrument had reached effective indicator, that is: (1) reaches is complete at achievement of educative participant learning with average of 77,59 with rule KKM = 65.

Finding

The result of assessment of validator to learning instrument, it can be categorized good, because in compilation of the subject, lesson matter was compiled from concrete things towards to abstract things, so it is expected to be able to facilitate in process of student understanding, although they were university student, but because of their ability characteristic difference, so their thinking process was also different. LKM developed was as according to problem solving, in other words the students were dribbled to finalize by their own way, find own strategy in solving the problem, so that the students were skillful in finding problems related to the reality of life and they can finalize their own problems, and finally student got autodidact amenity through compiled LKM.

RPP developed according to lecturer has been used in Mathematics program in UIN Suska Riau, has been described learning stages according to ability of students, although there were still problems which were not able yet to do by the students completely, this was resulted from time, for student who was capable to accomodate it with available time, for student who was not able in implementation, time provided for student to do LKM was less, they suggested before to do at home. According to validator, problems of the LKM have been competent for students of Mathematics Education FTK UIN SUSKA Riau. But, at the time of testing, there were still problems which cannot be done by students, and this thing was also because of time constraint which is not adequate.

Suggestion

In this research, it has been yielded the learning instruments of mathematics based on PBI at Opportunity Theory subject. To obtain instruments which are really good and/or to make perfect learning instruments which has been developed, so this is necessary to do learning instrument testing at other class and university with the same characteristic with the experiment class.

REFERENCES

- Arthur, L. B. (2008). *Problem Solving*. U.S: Wikimedia Fondation, Inc. Tersedia: [http://en.wikipedia.org/wiki/problem Solving](http://en.wikipedia.org/wiki/problem_Solving), 16 April 2010.
- Delva, Dianne, (2006), *Problem Based Learning/Tutor Handbook*. Fakultas of Medicine Queen'n University
- Dhany, I.N. 2011. Pengembangan Perangkat Pembelajaran Model Problem Solving Materi Dimensi Tiga Kelas X. Tesis Semarang: PPs Unes.
- Dick. W, dan Carey. L, 1990. *The Systematic Design of Instructonal Third Edition*. Florida: Harper Collins Publishers.
- Erman Suherman, dkk. 2004. *Common Textbook Strategi Pembelajaran Matematika Kotemporer*. Bandung : JICA-Universitas Pendidikan Indonesia (UPI)
-2001. *Evaluasi Proses Dan Hasil Belajar Matematika*. Jakarta: UT. Depdiknas.
- Fauzan, Ahmad. 2002. "Applyng Realistic Mathematics education (RME) in Teaching Geometry in Indonesian Prymary Schools". *Thesis*, tidak diterbitkan. University of Twente. Enschede.
- Hamalik, Omar. 1999. *Kurikulum dan Pembelajaran*. Jakarta: Bumi Aksara.
- Lufri, 2003, *Pembelajaran Perkembangan Hewan Berbasis Problem Solving yang Diintervensi dengan Peta Konsep dan Pengaruhnya terhadap Berpikir Kritis Dan Hasil Belajar Mahasiswa Jurusan Pendidikan Biologi*. UNP Padang Disertasi. Surabaya: tidak diterbitkan
- Muslimin Ibrahim, dan Muhamad Nur.2005. *Pembelajaran Berdasarkan Masalah*. Surabaya: Unesa University Press.
- Joni, T.R,& Wardhani, I.G.A.k, 1984. *Pengembangan Paket Belajar*. Jakarta: Depdikbud, P2LPTK
- Kemp, Jerrol E. 1994. *Proses Perancangan Pengajaran*. Bandung : ITB Bandung
- Keller, Jhon M. 1993. Motivational design of Instruction. Dalam Reigulth, Charles M. (Ed.), *Instructional Design Theories and Model: An Overview of Their Current status*. London: Law Rence erldaum Associaties Publishers.
- Lambas, dkk. (2004). *Materi Pelatihan Terintegrasi Matematika* (buku 3). Jakarta: Depdiknas
- Nana Syaodih Sukmadinata. 2007. *Metode Penelitian Pendidikan*. Bandung: Roda Karya.
- Reigeluth,CM., 1983. *Instructional-Design Theories and Models: An Overviewof Their Current Status*. Hillade,N.J: Lawrence Erlbaun Associates

- Ronnis, Diane. 2000. *Problem- Based Learning for Math and Science: Integrating Inquiry and the Internet*. Illionos: Skylight Professional Devalopment .
- Sahertian CDW. 2004. "Pengaruh Penggunaan Bahan ajar dan Gaya Belajar terhadap Hasil Belajar". (www.pendidikan.net diakses 26 November 2007)
- Sardiman AM, 2007. *Interaksi dan Motivasi Belajar Mengajar*. Jakarta : PT. Raja Grafindo Persada
- Sudjana. 2001. *Penilaian Hasil Belajar Mengajar*. Bandung: PT. Remaja Rosda Karya
- Sugiyono. 2007. *Metode Penelitian Pendidikan-Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta
- Trianto. 2009. *Mendesain Model Pembelajaran Inovatif-Progresif*. Jakarta: Kencana
- Uzer Usman. 2004. *Menjadi Guru Profesional*. Bandung: PT. Remaja Rosyda Karya.