Performance-Based Learning Model in College

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Abstract. This study produces a performance-based mathematics learning model for the international class program (ICP) students in college. Hasil penelitian telah memperoleh Disain pengembangan – which according to plomp (2007) consisting of three output components, which is intervention outcomes, principle design (intervention theory), and professional development, and outcome components. The results of this study satisfy the criteria proposed by Nieven (2007: 96), which is having a content validity, consistent internal (reliability), practical, and effective. The design of the development outcomes (which is the PMK-ICP Model) is implemented in lectures at universities with experimental settings by comparing PMK-ICP Models with other learning Models. The results of experimental studies, statistically concludes that there is a significant difference between the experimental group learning result that is using the PMK-ICP Model compared to the control group learning result that is using the conventional method using discussion method, so it can be concluded that the learning model of PMK-ICP is effective used in International Class Program students (ICP) Department of Mathematics FMIPA UNM.

1. Introduction

Research on learning model which already exists mostly done in secondary school or elementary school. Meanwhile, learning in college should also need to be revealed. This study aims to reveal the syntax learning model in college. Thus, it can be said that one of the main problems which faced by the education world today is how to improve the education implementation and to improve the quality of graduates in accordance with the competencies that every college student wants to achieve.

The educational process at the Faculty of Mathematics and Natural Sciences in Makassar State University is directed to produce qualified graduates: proficient, faithful, and devoted; have both academic and professional skills; able to apply, develop and enrich the treasury of science and technology; having high integrity, insight of nationality and culture of Indonesia; also become an independent, creative, innovative, dynamic, entrepreneurial spirit, and global perspective in realizing the welfare of society. Graduates must also have the academic skills with a mastery of basic and applied sciences.

To achieve the things above, some courses at the International Class Program (ICP) of the Faculty of Mathematics and Natural Sciences UNM have an important role to equip students mastering the learning materials in order to produce graduates who have better competence and competitiveness.

The change of learning paradigm as stated in the strategic plan of UNM, which is from the teacher centered learning process to the student centered learning (SCL) process with lecturer as the facilitator, must be preceded by the change of learning method.
By considering the description above, a special strategy is required, institutionally, to encourage the development of learning methods that are more suited to the demands of the achievement of bachelor competency as described above, through the utilization of learning facilities and learning infrastructure of faculty and departments optimally.

This research is examines the Development of PMK-ICP Learning Model at the stage of Implemented Intervention which is Implemented intervention with a Field test by Experiment and Dissemination, Journal, Books, e-learning.

The result of this development research hopefully can support a better learning result in college. This research is set in the form of experiment in order to know the effectiveness of the development of learning models of mathematics based on performance by comparing it with the conventional model using the discussion method on the learning process of the student in ICP

2. Literature Review

2.1 Learning Model

Learning model is defined as a systematic procedure in organizing learning experiences to achieve learning objectives. Learning model can also be interpreted as an approach used in learning activities. So that learning model has the same meaning with the learning approach, strategy or method.

There are several characteristics of the learning model in particular: (1) the logical theoretical rationale composed by the creators or developers, (2) the basis of thinking about what and how students learn, (3) the teaching behavior that is needed for the model so it can be executed successfully, and (4) a learning environment that is needed for learning objectives can be achieved.

As an educators, lecturers and teachers should be able to choose the appropriate learning model for students. Therefore, in choosing the learning model, educators should consider the condition of their students, learning materials and what learning resources is available, so that the use of learning models can be applied effectively and support the student's learning achievement.

Joyce, Weil dan Showers [1] describes the meaning of the learning model as follows: “A model of teaching is a plan or pattern that we can use to design face-to-face teaching in class rooms or tutorial setting and to shape instructional materials-including books, films, tapes, computer-mediated program, and curricula (long term courses of study). Each model guides us as we design instructional to help students achieve various objectives”.

Furthermore Joyce, Weil and Calhoun [2] describe this definition in a more elegant language as follows: models of teaching are really models of learning. Model of teaching is a description of a learning environment, including our behavior as teachers when that model is used. These models have many uses, ranging from planning lesson and curriculums to designing instructional materials, including multimedia programs.

The learning model according to Eggen & Kauchak [3], is a learning perspective strategy designed to achieve learning goals. According to Arends [4], a learning model should refers to a learning approach which will be applied and also should refers to the learning environment and classroom management.

The learning model described by Arends [4] has four characteristics, which is 1) rational theoretical that is logaly derived from its development, 2) the basis of thinking about the task of learning that will be achieved and how the students learn to achieve that goals, 3) lecturer's teaching activities, aims to make the learning model used effectively, and 4) the learning environment, aims to achieve the goal.

Joyce, Weil, & Calhoun [2] describe the learning model into four main elements. as follows: (1) model orientation in the form of targets and assumptions, (2) learning model components consisting of: syntax (model structure), social system, reaction principle, support system, (3) model application, and (4) instructional and nurturant effect of the model.

Furthermore, Rather (2006, 26-27) describes each element as follows:
2.1.1. Model Orientation
Aspects that are the orientation of the learning model are the goals of the model, the theoretical assumptions of the model, and other major principles and concepts of the model.

Components of the Learning Model

The learning model has four components, as follows:

Syntax. Syntax or model structure means - a description of the model in action. Each model has several phases and activities that are organized into a permanent set of provisions. By knowing the syntax of a learning model, the work of educators will be easy. Educators will know how to start and process further to achieve their goals.

Reaction principle. Each model has a reaction principle of concern to the educator. Educators will know how to react to the student's responses / activities. For example, during the learning process, the teacher asks the student to get the response. How will teachers react to student responses? How to accept the correct response and how to reject the wrong response with no despair. The entire learning process has four main stages, which is objectives, entry behavior of the students, the instructional process, and assessment of the outcomes. These four stages are each related and interdependent. In the implementation of this stage-the educator will relate to the student, who accepts or rejects the student's response.

Social system. Learning models are also linked with the relationship between educators and those being taught. The interactive role between the two is very important. Differences in interactive roles encouraging the emergence of several types of linkages and social connections - that ultimately foster and create social efficiency.

Support system. Each learning model has a support system that contributes to the success of the learning model. The classroom environment support system is appropriate for the model. The functions of the learning model - that way-move on to the atmosphere that will support the model further and make it work better. So the support system of each model builds its success.

2.1.2. Model Application
In each learning model, the application is an important element. If these key elements are not available, the learning model may not be effective. This element illustrates the application aspect of the model where students can apply the lesson in other situations. The application element of the model provides information-about the use of the model in the class. Sometimes this information is an illustration of various subject areas, a guide to adapt the age level or to design the curriculum, or suggestions to combine the model with other learning models.

a. Instructional dan Nurturant Effect
Instructional effect is the direct effect of the learning environment in the model, while the nurturant effect is the indirect effect of the learning environment in the model. Linda S. Behar-Horenstein [5] explains that each model of learning promoting instructional and nurturant effects. The instructional effect refers to change in the basis of a skill or in the basis of knowledge. The nurturant effect refers to non-instructional developments such as changes in habits, perceptions of self, and so forth, also including social or emotional development. All models are characterized by instruction phases, class structure, instructional support, and student regulation and regulation. Each model is a Type of instructional practice (illustrated in how the instructor demonstrates learning as what expected). Joyce and Calhoun [2] classify these models into four: information processing, social, personal, and behavioral systems approaches.

Explicitly, using learning models can accelerate the learning of students, encouraging them to improve their academic achievement and improve capacity and facilities in learning, [2]. Learning through various domains of feelings and processes. Using various learning models which are more suited to the style of students will strengthen students to develop skills in their own style (McCarthy, 1990; 2000).
b. Learning Device
The prototype learning device for a performance-based mathematics learning model for future educator students in the International Class Program which will be developed following the Harkness, Lane & Harwood research tools in the Mathematics Department. Devices developed by Harkness, Lane, & Harwood are having an effective cost. This research tries to adopt it-in subjects that are taught in International Class Program. They describe four main components of lecture design as follows: a) course materials (study guides, computer lab activities, and A guide for using the software package), b) uses of technology / computer aspects, c) assessments of student learning, d) tutorial sessions.

c. Learning Device Development Design
In research development, research design are required. Plomp [6] state that: "we characterized educational design in short as method within which one is working in systematic way towards the solving of a 'make' problem", which means that we briefly characterize the design of education as a method in which people work systematically toward the solution of the problem created. A common model for solving the educational problem put forward by Plomp [6].

A common model for solving the problem that stated by Plomp above consisting of preliminary investigation; designing phase; realization/ construction phase; test, evaluation and revision phase ; and implementation phase.

- Preliminary investigation Phase
One of the important elements in the design process is defining the problem. If the problem is a gap between what is happening and what is expected, then it is necessary to investigate the cause of the gap and carefully describe it. The term "preliminary investigation" is also often called as "needs analysis" or "problem analysis." Plomp and van de Wolde [7] states: "In this investigation important elements are the gathering and analysis of information, the definition of the problem and the planning of the possible continuation of the project."

- Designing Phase
In this phase, solution is designed starting from the definition of the problem. Activities in this phase aims to designing problem solving which was put forward in the preliminary investigation phase. The result of the design is a blueprint of solving. Plomp [6] states: "Characteristic activities in this phase are the generation of alternative (part) solutions and comparing and evaluating these alternatives, resulting in the choice of the most promising design or blue print for the solution."

- Realization/Construction Phase
Design is a work plan or a blueprint - which will be realized in order to obtain solutions in the realization / construction phase. Plomp [6] states: "In fact, the design is a written out or worked out plan which forms the departure point for the phase in which the solution is being realized or made. This is often entail construction or production activities such us curriculum development or the production of audio-visual material."

- Test, Evaluation, and Revision Phase
A developed solution should be tested and evaluated in practice. Evaluation is the process of collecting, processing and analyzing information systematically, to obtain the realization value of the solution. Plomp and Van de Wolde [7] states: "Without evaluation it can not be determined whether a problem has been solved satisfactorily, in other words, whether the desired situation, as described in the definite formulation of the problem, has been reached.

- Implementation Phase
Implementation phase can be a situation that takes place during research, especially in the location and research environment. Other phases that take place or being implemented by considering the situation and conditions that exist and occur in the field. After evaluating and obtaining product results, then the product can be implemented on a wider area. Plomp [6] states: "Solutions have to be introduced, in other words, have to be implemented." This means that solutions must be introduced, in other words to
be implemented. Prototypes that have met the criteria of validity, effectiveness, and practicality can be implemented in a wider area or area

3. Research Method

The main purpose of this research is to developing a mathematics learning model based on performance for student who is a prospective teacher in the International Class Program (ICP) and also to developing a learning tools which support the model. Then this research includes some kind of development research, or commonly called as Research and Development (R&D) [8,9,10].

The resulting development stage is stage 4 implemented intervention as follows:

Field Test by Experiments: Model PMK-ICP

3.1. Dissemination, Journal, Books, e-learning.

An experiment was conducted as the result of the model development with the implementation design using quasi experiment with non-equivament control group design. The design is used in experiments using existing classes as a group, by selecting classes that are expected to be similar in circumstances or conditions.

Population in this research is all the ICP students of Mathematics Department, Faculty of Mathematics and Sciences, Universitas Negeri Makassar. The main feature of the quasi experiment method is this method does not use random assignments and use the existing groups as its sample.

The experimental class which is meant is the class that using performance-based mathematics learning model (PMK-ICP) on their learning activities and the control class which is meant is the class that using conventional model with discussion method their learning activities on ICP of Mathematics Department FMIPA UNM.

Data were analyzed by using Covariance Analysis Test to verify the research hypothesis. Before performing the hypothesis test, a prerequisite test is performed first. The prerequisite test analysis includes normality test, homogeneity variance test, linearity test, and homogeneity test of the slope of the line (interaction test). Data were analyzed by using SPSS and Minitab software with 5% significance level.

The learning model of PMK-ICP is called effective if there is a significant difference of mathematics learning result between the experimental class and the control class.

4. Result And Discussion

In accordance with the cyclical development stages of Plomp [14], here is a detailed description of the development of the Performance Based Mathematical Learning Model for future educator student at the International Class Program and its Supporting Devices. The Performance-Based Mathematics Learning Model for Student of International Class Program hereinafter abbreviated as PMK-ICP Model.

The results of the development are as follows:

4.1. Results at the Preliminary Research Stage

4.1.1. Competency Based Learning Framework. Based on the three outputs produced by this study, the design principles in question are the PMK-ICP Model. The result of the intervention produced is courseware which refers to basic course materials as presented by Harkness [15], namely Lecturer's Guide, Course handout, and Workbook. Meanwhile, the professional development of lecturers is reflected in the planned learning activity, lecturing and evaluation of lectures based on the PMK-ICP model.

4.1.2. The Concept Applied to the PMK-ICP Model. In this model, research refers to the concept of learning model according to Joyce, Weil, and Calhoun [2] and the paradigm they used. The concept consists of: Andragogi-Pedagogic paradigm, Constructivism, Metacognition, and Scaffolding.
4.1.3. Main Elements of PMK-ICP Model
Rather (2006, 26) and Joyce, Weil, & Calhoun [2] describe the learning model into four main elements as follows: (1) model orientation of goals and assumptions, (2) learning model components consisting of: syntax (model structure), social system, reaction principle, support system, (3) application model, and (4) instructional and nurturant effects of the model.

4.2. Results at the Prototyping Stage
Nieveen [14] provides four stages which is the development focus in process of developing the prototype, which is; (1) global design, (2) detailed intervention, (3) complete intervention, and (4) implemented intervention.

The result of the development is the model and device of PMK-ICP through the implemented intervention stage is presented as follow:

4.2.1. PMK-ICP Model
After doing the development focusing on this first year Global Design, the results obtained are presented in PMK-ICP Model Book.

Details of the main elements of the model as follows:

a. PMK-ICP Model Orientation
   1. Purpose / Goal / Purpose Model, Adults are expected to enter the global workforce; Organizations or institutions even in courses or learning units.
   2. Assumptions used, Learning environment in Higher Education, therefore using the paradigm Pedagogy-Andragogy.

Characteristics of the taught field is using much of the latest information, until the Model more tends to be incorporated into the cluster of information processing models.

Even in some learning units, other clumps can also be used according to the characteristics of the subject that will be taught.

The concept that becomes the reference is constructivism, metacognition, Scaffolding, Zone of proximal development.

b. PMK-ICP Model Component
   According to Arends [4], the characteristics of the learning model are: (1) rational, theoretical, logical, and sourced from the design, (2) the rationale of the learning task which wanted to achieved and how the students learn to achieve the goals (3) teaching activities of lecturers needed for the learning model to be implemented effectively, and (4) the learning environment needed to achieve the goals.

   According to Joyce, Weil, & Shower [1], there are five important components of a learning model, that is; (1) the syntax, a sequence of activities whih also commonly called as phase, (2) the social system, the role of lecturers and students and also the types of rules required, (3) the principle of reaction, giving the lecturer a description of how to view or responding to student questions, (4) the support system, the devices and conditions required by the model, and (5) the impact of instructional and accompaniment, the results that the student will achieve after following the learning activities.

1) Syntax
   The syntax or structure of the PMK-ICP model is an adaptation of the PMKM model [16]. Target structure of PMK-ICP is Improved Student Performance.

   The syntax of PMK-ICP model consists of two patterns, which is macrosintax and microsintax. Makrosintaks is a sequence of learning in one semester, while micro syntax is a sequence of learning in each meeting. Macro syntax consists of: (1) overview, (2) preview, (3) inview, (4) review and (5) certification. The syntax in the PMK-ICP model does not only last for a single meeting, but last in one learning package in one semester. This is the difference between PMK-ICP syntax and previous learning models. Description of macrosintaks in one semester is shown in Macrosintaks table in one semester.
2) Overview
A thorough review on a topic at the beginning of the learning process. It aims to give students an overview of the topics to be studied. Especially for the first meeting at the beginning of each Semester, the Overview can be filled with activities to create a course master in a semester which is a summary or blueprint about all topics which will be taught during one Semester ahead which is usually already written in Syllabus or GBPP. Thus, from the very beginning, students know what topics will they learn in aims to allow the active students to learn more at home through the teaching materials provided. This activity was held at the first meeting.

3) Preview
Preliminary Overview id a continuation of the Overview so the preliminary overview is more detailed than Overview and can become a further elaboration of Syllabus or GBPP. Thus, the student is expected to have sufficient initial knowledge on the sub topic of the subject before more detailed discussion begins. Preview will be held at meeting II. In the preview section students can see the interrelationships between topics in the course for one semester along with the tasks which they will complete.

4) Inview
An in-depth review that is at the main activity of a learning process whereby a topic will be discussed in detail and in depth. During Inview, students are expected to record important information, concepts or formulas along with charts, lists or diagrams to help students understand and understand the material to be taught. In the inview phase, it is generally implemented based on three main activities, which is exploration, elaboration and confirmation.

Exploration activities, lecturers: (1) involving students in seeking broad and deep information about the topic / theme of the subject that will be learned by applying the principles in learning – learning from many sources. (2) using a variety of learning approaches, instructional media, and other learning resources; (3) facilitating interaction between students and also between students with lecturers, the environment, and other learning resources; (4) involving students actively in every learning activity; and (5) facilitating students to experiment in laboratories, studios, or fields.

Elaboration activities, lecturers: (1) make the students familiar with reading and writing through meaningful tasks; (2) facilitating students through the assignment of assignments, discussions, and others to come up with new ideas both spoken and written; (3) giving students the opportunity to think, analyze, solve problems, and act without fear; (4) facilitating students in cooperative and collaborative learning; (5) facilitate students to compete in a healthy way to improve learning achievement; (6) facilitate students to make exploratory reports whether written or spoken, individually or in groups; (7) facilitating students to present content; individual or group work; (8) facilitating students to exhibit, tournaments, festivals, and products; and (9) facilitate students to undertake activities - which fosters students' sense of pride and confidence.

Confirmation activities, lecturers: (1) provide a positive feedback and reinforcement in the form of oral, written, gestures, or gifts to the student's achievement, (2) to confirm the results of student exploration and elaboration through various sources, (3) facilitating students to reflect in order to gain the learning experience that has been done,(4) facilitate students to gain a meaningful experience in achieving basic competencies: (a) serve as a resource person and facilitator in answering questions of students when they face difficulties, using the correct and standard language; (b) help students to solve the problem; (c) provide a guidance so that the student can check the exploration results; (d) provide information to explore further; and (e) provide motivation to students whose not actively participate.

5) Review
Review held at the meeting to 14 to 15 and it was made in the form of summary of the subject that has been taught and emphasized on important information, concepts or formulas that must be remembered
or mastered by students and the instructional application that directs students' understanding of vocational skills. This will help students to focus on re-learning all the materials taught.

6) Certification
Performance assessment with portfolio. In this phase, evaluation or assessment and follow-up in learning activities are conducted. The purpose of this stage is to determine the success rate of the second stage (instructional). The five stages discussed above, is a series of activities that are integrated, inseparable from each other. Lecturers are required to be able to manage the time and activities flexibly, so that five series are accepted by the students as a whole. Herein lies the professional skills of a lecturer in implementing teaching strategies. The teaching abilities described in the above description are theoretically easy to master, but in practice they are not as easy as they are described. Only with practice and planned habits can that ability be obtained.

Performance assessment: a form of assessment that allows students to demonstrate a range of skills or behaviors, products, and in a particular context demonstrating both. Target performance assessment: knowledge, reasoning, skills, products, and affective (Stiggins, 1994). There is a various variation, such as performance assessment projects and performance task management [14]. Performance assessment asks students to complete complex and concrete tasks, by mobilizing initial knowledge, newly acquired learning, and relevant skills to solve realistic or authentic problems. Some of the characteristics of the performance assessment are: (1) composing responses, (2) high-level thinking, (3) authenticity, (4) alignment, (5) processes and products, and (6) depth and broad but superficial [15]. There is really nothing new in the performance assessment methodology. The main challenge is how to make performance assessments in accordance with the standards. There is no place in the performance assessment for "intuition, feeling, and guesswork (Stiggins, 1994).

c. PMK-ICP Model Effects
The instructional effects of the PMK-ICP model are: (1) improving students' cognitive abilities, (2) improving students' metacognitive skills and (3) improving students' attitudes toward learning technology. While the companion impact of this model is (1) increased learning activities, (2) increased learning independence, and (3) increased discipline in learning.

The validation of the items from all constructs of the PMK-ICP Model Development component is valid and reliable. It means that the supporting theories in PMK-ICP Model Development are very strong and interrelated among the theories outlined in the PMK-ICP Model Development book.

The results of the analysis show that the content validity coefficient for the PMK-ICP Model Development book is valid, it means that the interventions that have been done in developing the PMK-ICP Model Development can be declared valid or has a high degree of validity. The results of the analysis also show that the reliability coefficient obtained for PMK-ICP Model Development based on the experimental assessment is also reliable or has a high level of reliability.

The content validity coefficient for Lecturer Manual Book is also valid, it means that the intervention has been done in developing the supporting tools of PMK-ICP Model Development especially the Lecturer Manual Book can be declared valid or has a high level of content validity. The results of the analysis also show that the reliability coefficient obtained for the Lecturer Guidebook based on the experimental assessment is also valid which means that the Lecturer Guidebook is reliable or has a high level of reliability.

The content validity coefficient - for the Student Manual book is also valid, it means that the intervention made in developing the PMK-ICP support device specifically the Student Manual can be declared valid or has a high degree of content validity. The results of the analysis also show that the reliability coefficient obtained for the Student Manual based on the experimental assessment is also valid which means the Student Manual is reliable or has a high degree of reliability.

The result of item validation for the entire construct of components of the PMK-ICP Model is valid and reliable. It means that the supporting theories in the development of the PMK-ICP Model are very strong and interrelated among the theories described in the book PMK-ICP Model. Similarly, the
validation results of supporting tools for the implementation of PMK-ICP Model, it was found that all supporting tools for the implementation of PMK-ICP Model are valid and reliable. That means that all the supporting tools for PMK-ICP Model Development are eligible to enter the next stage of development which is the details of intervention and complete intervention.

Same things applies to the validation of supporting tools for the implementation of PMK-ICP Model which consist of: (1) a learning units consisting of handouts and syllabus (2) student worksheets consisting of worksheets, (3) Lecturer Handbook, (4) Student Handbook , and (5) teaching materials. The results show that all supporting tools for the implementation of PMK-ICP Model are valid and reliable. This means that all the supporting tools for the implementation of the PMK-ICP Model are feasible to be tested in the classroom

4.3. Descriptive Statistics
Descriptive statistical results show that the learning result of the experimental class students are in the “high” category while the control class are in the "medium" category. If the average value is considered, then the average learning result of the experimental group is higher than the control group.

From the descriptive results, can be obtained that generally the description of the learning result of the experimental group which using PMK-ICP model is higher or better than the learning result of the control group which using discussion method of the conventional learning model.

4.4. Inferential Statistics
Before discussing about hypothesis testing, complete the prerequisite analysis first. The prerequisite analysis consisting of:

4.5. Normality Test
Testing normality using Kolmogrov-Smirnov normality test obtained results that the data sample comes from the population that is normally distributed, so normality can be fulfilled.

4.6. Homogeneity Test
Testing homogeneity using Levene test obtained result that data variance is homogeneous, so homogeneity can be fulfilled.

4.7. Hypothesis Test
Statistical analysis used was ANACOVA. The result shows that there are statistically significant difference between the learning result of the experimental group using learning with PMK-ICP model compared with the learning result of the control group that is learning by conventional method using discussion method.

5. Conclusion
If the average value of the learning results is considered, then the average learning result of the experimental group is higher than the control group. So it can be concluded that the learning model of PMK-ICP are effectively used in International Program students (ICP) Mathematics Department FMIPA UNM.

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