EFFECT OF PBL METHOD ON CRITICAL THINKING IN MATHEMATICS PROBLEM SOLVING AMONG MATRICULATION COLLEGE STUDENTS

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ABSTRACT

The purpose of this research was to study the effect of PBL method in promoting critical thinking in mathematical problem solving among students in matriculation colleges. This quantitative study was conducted using quasi experiment design. The study population consists of mathematics students from Malaysian matriculation colleges. The sample for the study was selected from one of the fifteen matriculation colleges using the convenience sampling method. Research respondents consisted of 159 students who were allocated to experimental group and 162 students allocated to control group. Both groups were given an assignment to solve mathematics problems in number system, sequence and series using respective intervention methods. Data for critical thinking were obtained using five criteria which are observation and inference; listing information; finding strategies; assessing accuracy and finding alternative solutions. Reliability and validity of the instrument used to study critical thinking were determined through a pilot test. This instrument had a Cronbach-α value of 0.958. The findings showed that PBL teaching and learning method was effective in promoting critical thinking among Malaysia matriculation college students. PBL method was found to be effective in encouraging all critical thinking criteria except in finding alternative methods of solutions to given problems. The results also showed that students from the routine method group did slightly better in solving mathematics problems compared to PBL method group. The implication of this study was that PBL method has potential to be used as an alternative pedagogy to encourage critical thinking in Malaysian matriculation college students. This method can also be used for subjects other than mathematics.

KESAN KAEDAH PBL PADA PEMIKIRAN SECARA KRITIS DALAM MENYELESAIKAN MASALAH MATEMATIK DALAM KALANGAN PELAJAR KOLEJ MATRIKULASI

ABSTRAK

Tujuan kajian ini adalah mengkaji kesan kaedah PBL dalam menggalakkan pemikiran secara kritis bagi menyelesaikan masalah matematik dalam kalangan pelajar kolej matrikulasi. Kajian kuantitatif ini dijalankan menggunakan reka bentuk uji kaji kuasi. Populasi kajian ini terdiri daripada pelajar matematik dari kolej-kolej matrikulasi Malaysia. Sampel kajian telah dipilih daripada salah satu daripada lima belas kolej matrikulasi dengan menggunakan kaedah persampelan mudah. Responden kajian terdiri daripada 159 pelajar yang dibahagikan kepada kumpulan eksperimen dan 162 pelajar dibahagikan kepada kumpulan kawalan. Kedua-dua kumpulan telah diberi tugasan untuk menyelesaikan masalah matematik dalam sistem nombor, jujukan dan siri dengan menggunakan kaedah intervensi masing-masing. Data bagi pemikiran kritis telah diperoleh menggunakan lima kriteria, iaitu pemerhatian dan inferens; menyenaraikan maklumat; mencari strategi; menilai ketepatan dan mencari kaedah penyelesaian alternatif. Kebolehpercayaan dan kesahan instrumen yang digunakan untuk kaji pemikiran secara kritis ditentukan melalui ujian rintis. Instrumen ini telah mencapai nilai Cronbach-α sebanyak 0.958. Dapatan kajian menunjukkan bahawa kaedah pengajaran dan pembelajaran PBL adalah efektif dalam menggalakkan pemikiran secara kritis dalam pelajar kolej matrikulasi Malaysia. Kaedah PBL didapati berkesan dalam menggalakkan semua kriteria pemikiran secara kritis kecuali dalam usaha mencari kaedah penyelesaian alternatif untuk masalah yang diberi. Keputusan juga menunjukkan bahawa pelajar dalam kumpulan kaedah rutin telah menunjukkan prestasi yang baik sedikit dalam menyelesaikan masalah matematik berbanding kumpulan kaedah PBL. Implikasi kajian ini adalah kaedah PBL berpotensi digunakan sebagai pedagogi alternatif untuk menggalakkan pemikiran secara kritis di kolej-kolej matrikulasi Malaysia. Kaedah ini boleh juga digunakan untuk matapelajaran selain daripada matematik.

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LIST OF ABBREVIATIONS

AKEPT	*Akademi Kepimpinan Pengajian Tingg* (Higher Education Leadership Academy)
C	Control group (routine method group)
CLA	Collective learning aspects of PBL method
CT	Critical thinking
DP	Dependent variable
E	Evaluating the solution for accuracy
FILA	Facts, Ideas, learning outcomes and action plan
HOTS	Higher order thinking skills
I	Information on the facts of the problem
IHE	Institutions of higher education
IRR	Inter-rater reliability
MANOVA	Multivariate Analysis of Variance
MEBP	Malaysia Education Blue Print 2013-2025
MOE	Ministry of Education, Malaysia
O	Observation and inference on the problems
OBE	Outcome Based Education
PBL	Problem-based Learning
PBL method	Problem-based Learning method
PISA	Program for International Student Assessment

PS	Problem solving
RQ	Research questions
RT	Routine method of teaching and learning
S	Drawing up a strategy to solve the problem
SCL	Student centered learning
SPM	*Sijil Pelajaran Malaysia* (Malaysian Certificate Of Education)
SPSS	Statistical Packages For The Social Science
STPM	*Sijil Tinggi Pelajaran Malaysia* (Malaysian Higher Certificate Of Education)
TIMSS	Trends in International Mathematics and Science Study
UPS	*Ujian Pertengahan Semester* (Mid Semester Test)
X	Experimental group (PBL method group)

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CHAPTER 1

INTRODUCTION

1.1 Background

The traditional version of Problem-based Learning (PBL) approach of teaching has been adopted and modified in this research to aid in the holistic teaching of mathematics among the Malaysian matriculation college students. The main issues addressed by the modified PBL method of teaching are critical thinking in mathematics and mathematics problem solving. In assessing critical thinking, five main components of critical thinking are considered (Paul 2006). They are: 1) making *observation and inference*, 2) *listing out information,* 3) drawing *problem solving strategies and making a decision,* 4) *evaluating for accuracy* and 5) *finding alternative methods of solution.* While the main principles of traditional PBL are adhered to in the modified version of PBL method, some implementation aspects are changed to suit the requirements of Malaysian matriculation